User's Guide

INAT S7-TCP/IP

Ethernet interface

for the

S7

Version 1

Manual version 0101-001

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Range of delivery

This list of elements should be contained in the INAT S7-TCP/IP package:

- INAT S7-TCP/IP module
- Manual
- CD-ROM S7-TCP/IP

CD-ROM contents:

- INAT Parameterization Software
- Manual in pdf format
- PC-H1 driver
- INAT OPC Server TCPIPH1 (Version 32 points)
- OPC Client of the Rockwell Corp.
- S7 Project for the SEND/RECEIVE and the FETCH/WRITE communication

If any item is missing, call us under 0911 / 544 27-0

Note

**Programming of the MPI with the S7-TCP/IP is actually not being supported.
Connect your PC directly with the MPI interface of the S7-CPU via MPI cable.
Don't use the MPI slot of the S7-TCP/IP. With such a connection the module could be damaged!**

Note

**While installing the INAT S7-TCP/IP on a S7 rack, the power supply has to be turned off.
Tighten the screws modestly!**

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Contents

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1 Introduction

INAT S7-TCP/IP is the high performance Ethernet interface for S7 PLCs of the series 400. The universal communications processor can be used with both TCP/IP and H1 simultaneously and in parallel. Besides the S7 protocol the INAT CP supports the entire S5 AP header. With this number of protocols the INAT S7-TCP/IP may be integrated seamlessly in existing S5 and S7 - ethernet networks.

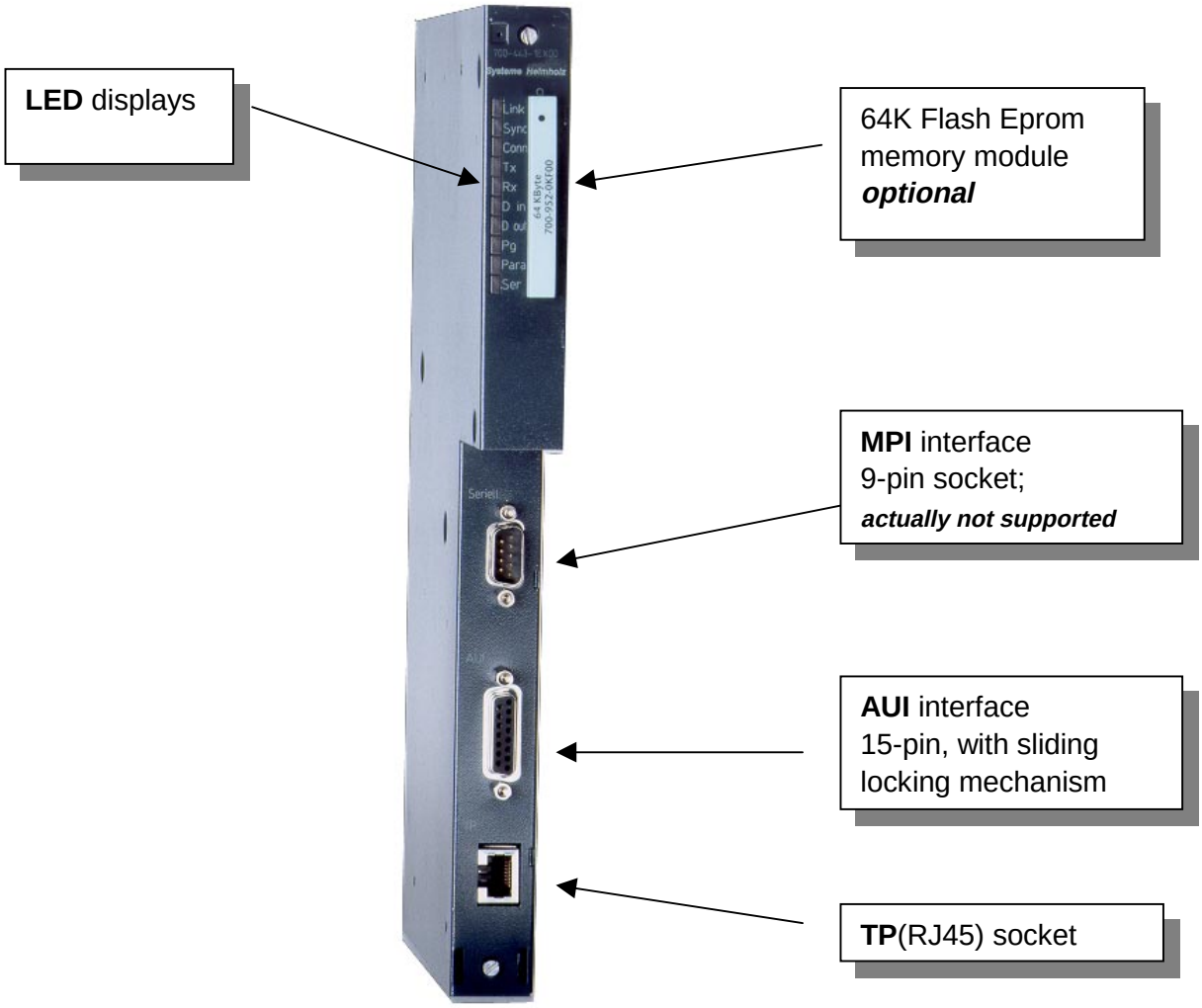

Figure 1-1 Communications processor S7-TCP/IP

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1.1 Layout of the Module

The layout corresponds to the standard components of the S7 automation systems of the series 400. Special features are:

- Simple module for fast installation on S7-400 rack.
- All the operator controls and displays are located on the front panel
- It can be used in central or expansion racks.
- One 9-pin PG/MPI interface for programming the S7-CPU.
- Two Ethernet connections for 10Mbit/s
  a) 15-pin SUB-D plug for the AUI adapter
  b) TP(RJ45) plug
- No fan necessary

1.2 Caracteristics

Parameterization

- Online via network (TCP/IP and / or H1)
- Offline on the PC with later transfer to the S7-TCP/IP.

Number of Connections

- 124 H1 connections
- 124 IP connections

CPU Types

To run the S7-TCP/IP, you need one of the following versions of the series 400.

CPU Type	Siemens Order No
CPU 412-1	6ES7 412-1XF02-0AB0
CPU 413-1	6ES7 413-1XG02-0AB0
CPU 413-2	6ES7 413-2XG02-0AB0
CPU 414-1	6ES7 414-1XG02-0AB0
CPU 414-2 with 128K	6ES7 414-2XG02-0AB0
CPU 414-2 with 384K	6ES7 414-2XJ01-0AB0
CPU 416-1	6ES7 416-1XJ02-0AB0
CPU 416-2 with 0,8 M	6ES7 416-2XK01-0AB0
CPU 416-2 with 1,6 M	6ES7 416-2XL01-0AB0
CPU 417 standard	6ES7 417-4XL00-0AB0

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Supported Communication Protocols

INAT S7-TCP/IP supports the following communication protocols:

Implemented Protocols	Max. Length of Data Block
SEND/RECEIVE Direct	32 KB
S7 Functions	
FETCH ACTIVE	Unblocked
WRITE ACTIVE	Unblocked
FETCH PASSIVE	32 KB
WRITE PASSIVE	32 KB
S5-AP Header	
FETCH ACTIVE	32 KB
WRITE ACTIVE	32 KB
FETCH PASSIVE	32 KB
WRITE PASSIVE	32 KB
Clock Functions	
Clock-Master	-
Clock-Slave	-

Supported Network Protocols

INAT S7-TCP/IP supports the following communication protocols on the network side:

- TCP/IP
- H1
- RFC1006 (ISO on TCP)
- PLC Header
- UDP
- Data transfer per FTP (File Transfer Protocol)
- Supports symbolic names according to the Domain Name System (DNS)
- SNMP sevices according to MIB II.

Data Transmission Security

- Top level security of data transfer via INAT PLC Header
- Permanent monitoring of the connection state by Life ACKs and Life data ACKs

Parameters Security

Double backup of parameters on the

- EEPROM and
- optional on the Memory Flash ROM CARD
  - 64 KB Order number: 64KB 700-7410-64
  - 256 KB Order number: 64KB 700-7410-256

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1.3 Installation

The module is designated to be used in the single-slot of a S7-400 rack. The following racks are being supported. The INAT S7-TCP/IP can be installed in every slot, except the slots reserved for the Power Supply and Head CPU.

- Central Rack CR2
- Universal Rack UR1
- Universal Rack UR2

Note

The power supply of the PLC has to be switched off, while you are installing the INAT S7-TCP/IP in a rack

Handling

- Switch off the power supply.
- Remove the cover panel of the slot you need to.
- Put the module - beginning on the upper side - in the slot (see figure).
- Insert the module by pressing the springscrew on the upper and the lower side (with the help of a screwdriver) into the bore-hole designated for. After the module is firmly in place, secure it by a mounting screw (in clockwise direction).

Avoid to tighten the screws too strongly!

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2 Getting Started

2.1 Requirements

The following minimum on technical resources is required to execute the following example:

- PC with Windows 95/98/NT/2000 operating system and a network card
  (If you have not already done so, set the IP address of your PC under NT. In the menu „Start/Settings/Control Panel/Network“ enter the following values in the „Protocols/Properties“ window for the IP address and the Subnet mask.)

- Communications processor S7-TCP/IP

- S7-400 (i.e., with CPU 413-1)

- Transmission path consisting of one of the following
  - Hub
  - TP cable to connect the PC and the control(s) with the network segment
  - MPI cable for programming the CPU

Programming of the S7 via the MPI interface of the S7-TCP/IP is actually not being supported.
Connect your MPI cable directly with the MPI interface of the CPU.
Don’t use the MPI interface of the S7-TCP/IP. With such a connection the module could be damaged!

- Software packages
  - INAT.NET Parameterization
    (The INAT Parameterization is freeware. You need it to register the CP in the net and to configure the connections. You can find an actual version of the Parameterization on CD-ROM under **INATS7CP\ParamNT\.** Install the Parameterization by doubleclicking the file **paramnt.exe.**)
  - Installation of the meta files
    Installl the device IDs for the hardware configuration of the S7 (see chapter 2.2.3).
  - **SIMATIC Manager** version 5 programming tool for programming the PLC
    (see the Siemens user manuals)
  - INAT communication blocks with programm logic of the Step 7
    You can find the necessary communication blocks on the CD-ROM under **INATS7CP\Project**
  - INAT OPC-Server TCP/IP & H1
    (You can find a demo version of the OPC Server on the CD-ROM under **INATS7CP\OPC\Demo_srv**. Install the OPC Server by doubleclicking the file OPCDemoD.exe.)

- OPC Client
  (You can find the OPC Client freeware on the CD-ROM under **INATS7CP\OPC\Client**
  Copy the files there to a directory of your choice.)

2.2 Registration of the S7-TCP/IP in the network

2.2.1 Installation of the Parameterization Software

Install the INAT Parameterization software as described in chapter 2.1!

2.2.2 Editing the Station parameters

If you will be executing this exemple with *new S7 TCP/IP modules*, the station name and the TCP/IP adresses have not yet been set. After starting, select "Parameterization via H1 or IP". In the window "Select the Station via..." only the ethernet address is set.

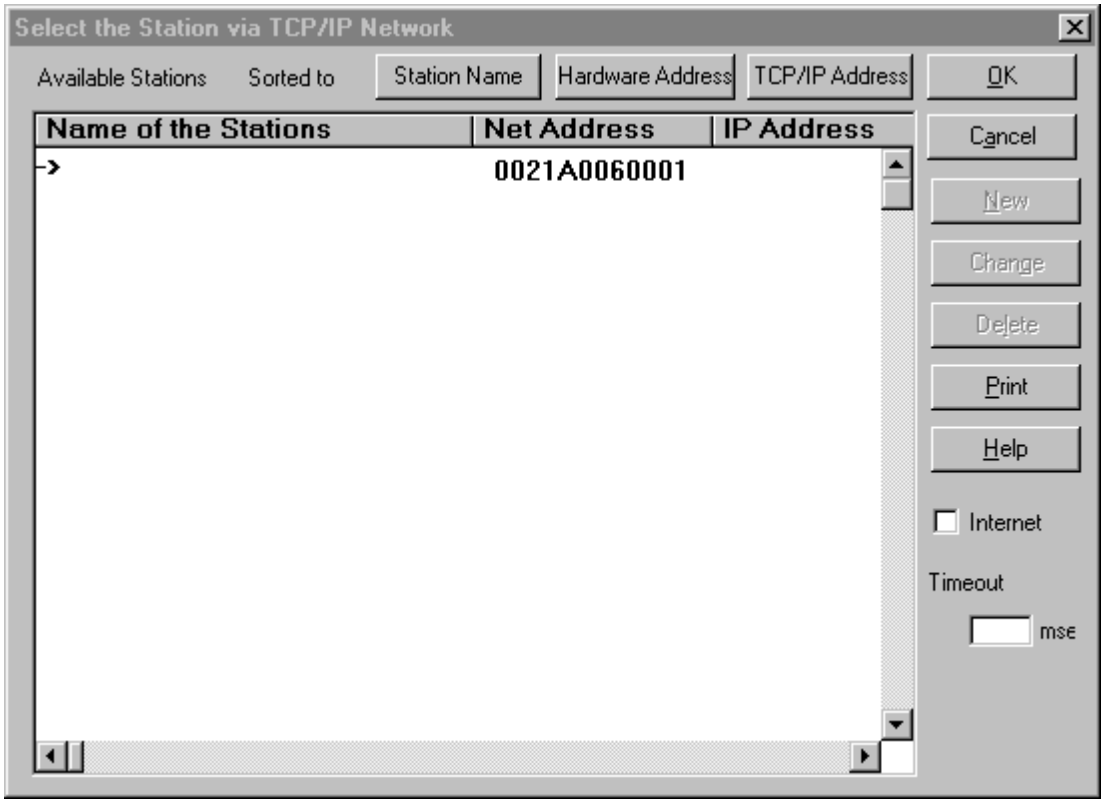

Figure 2-1: After startup only the hardware address of the module is set

Select the entry, which is marked with an arrow in front by doubleclicking. The dialog window „Station Parameters“ appears. The following parameters must be entered:

- Name
- IP address
- Subnet mask
- Domain Name Server
- Router

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If you wish you may enter a Station Password and change the Ethernet Address.

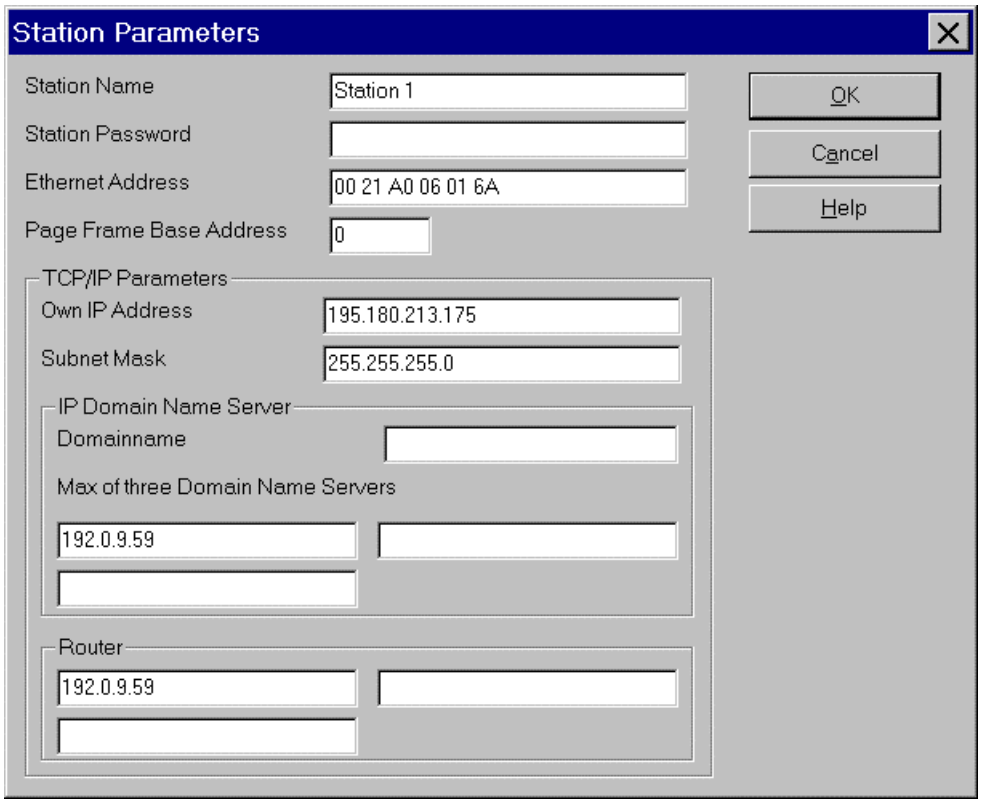


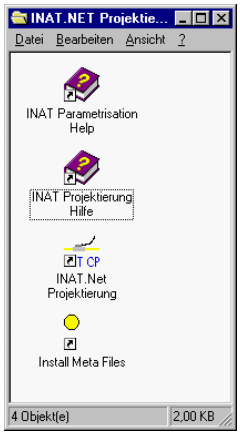
Figure 2-2: First Registration of the S7-CP in the net

Now the module is registered in the net and reachable via TCP/IP and H1. If the value of the IP address is set outside the subnetwork of your PC or router, you can install the delivered H1 driver. Then the TCP/IP parameters can be adjusted with the parameterization via H1.

You can find the H1 driver on the CD-ROM under INATS7CP\PCH1.

2.2.3 Installation of the Meta Files

Select the symbol „Install Meta Files“ in the INAT.NET Parameterization program group.



With a double click on the icon "Install Meta Files", the necessary device IDs to configure the hardware of the SIMATIC manager, will be installed. This installation is absolutely necessary. Otherwise the INAT S7-TCP/IP will not be recognized in the S7 hardware configurator.

With the next start of the SIMATIC manager, the meta files will be retranslated. If the error message „Option package not correctly installed“ occurs here, you have to install the „NCM S7 Industrial Ethernet“ from your Step 7 CD.

2.3 S7-TCP/IP in the S7 Hardware Configuration

First you have to register the module on the system with the software of the Siemens Step 7.

Start the SIMATIC Manager Version 5 and create a new project unter File/New

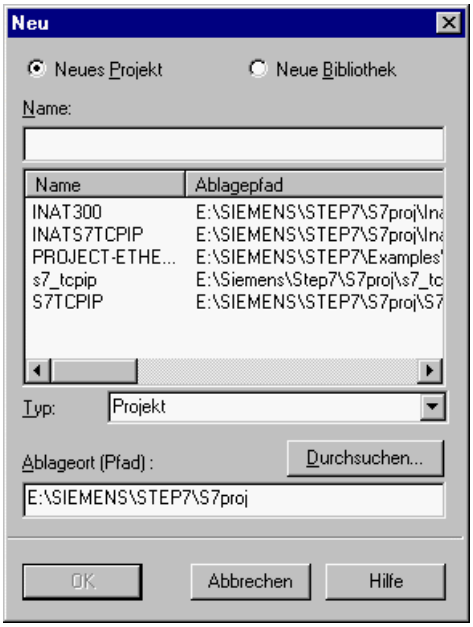


Figure 2-3: Creating a new project in the Simatic Manager

Select the SIMATIC S7-400 under Insert/Station. The following window appears

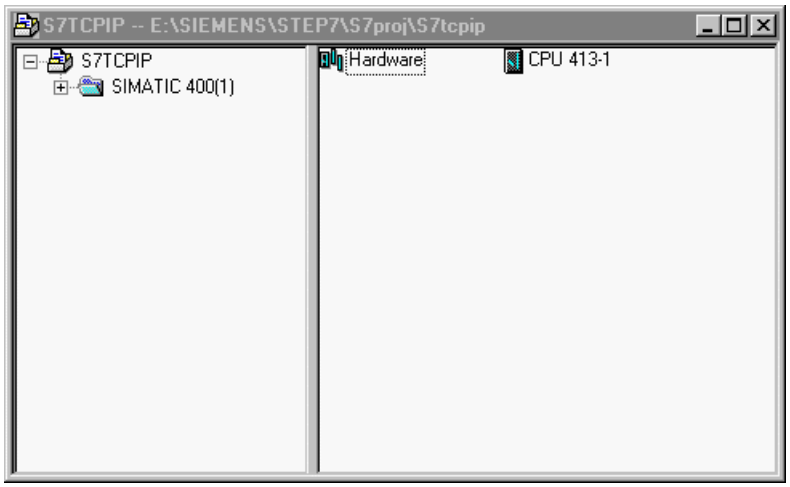


Figure 2-4: Project in the basic form

Select in the right frame of the S7 project the S7 hardware configurator with a double click on the icon "Hardware".

The next dialog window offers the possibility to show the real hardware configuration on the SIMATIC manager.

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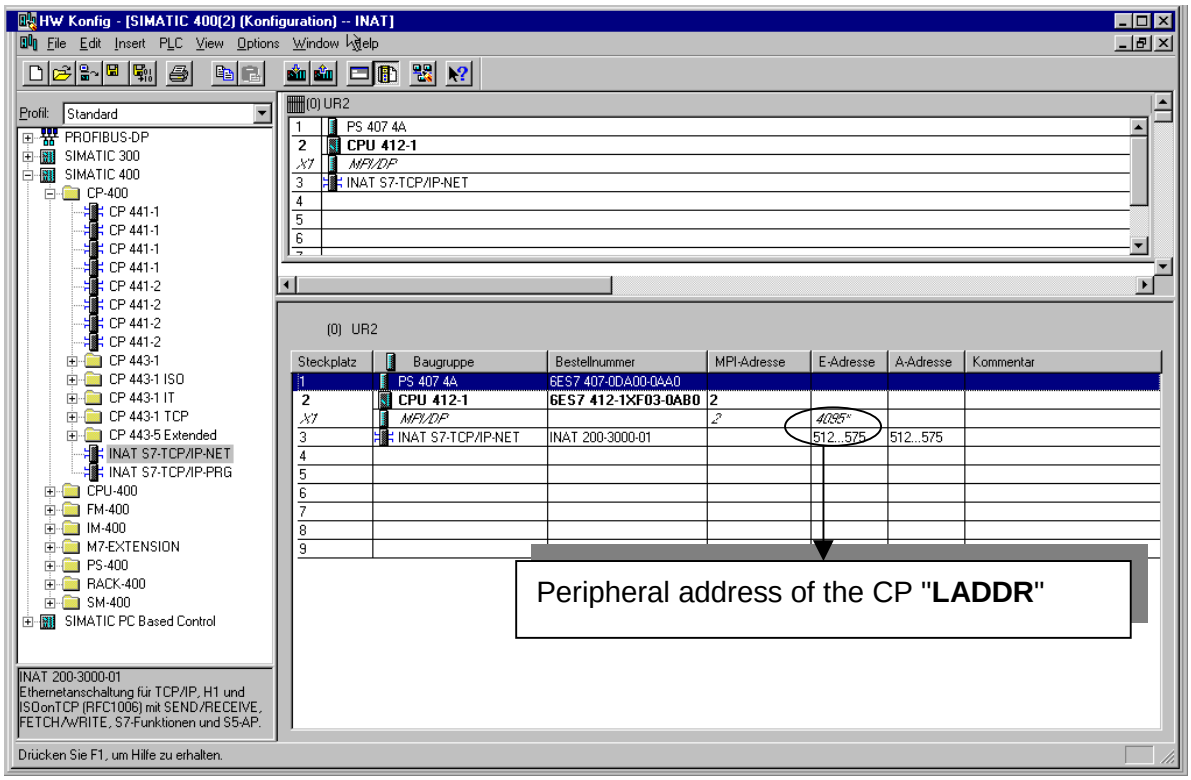
- Rack Type
  First select the used rack type under "Rack-400" (here rack UR2 was selected).
- Power Supply
  Select the actual used power supply under PS-400 (here PS 405 4A)
- S7 CPU
  Select the CPU type in the directory CPU 400 (here CPU 413-1)
- INAT S7-TCP/IP
  You can find the S7-TCP/IP in the directory CP-400 under INAT S7-TCP/IP-NET or INAT S7-TCP/IP-PRG. Please select **INAT S7-TCP/IP-NET**.
- The peripheral address (LADDR) is automatically be set by the S7. It also can be adjusted. Note that inputs and outputs have to be equal.



- Please store the edited hardware configuration and load it to the CPU.

2.4 Example SEND/RECEIVE Direct Communication

2.4.1 Tasks to be Performed

In our example, a communication task between two controllers via two INAT S7-TCP/IP communications processors and a PLC will be described. Figure 2-5 shows the system layout for this case. This permits high-speed data communication between the two modules. On the software side, communication is handled by the communication blocks.

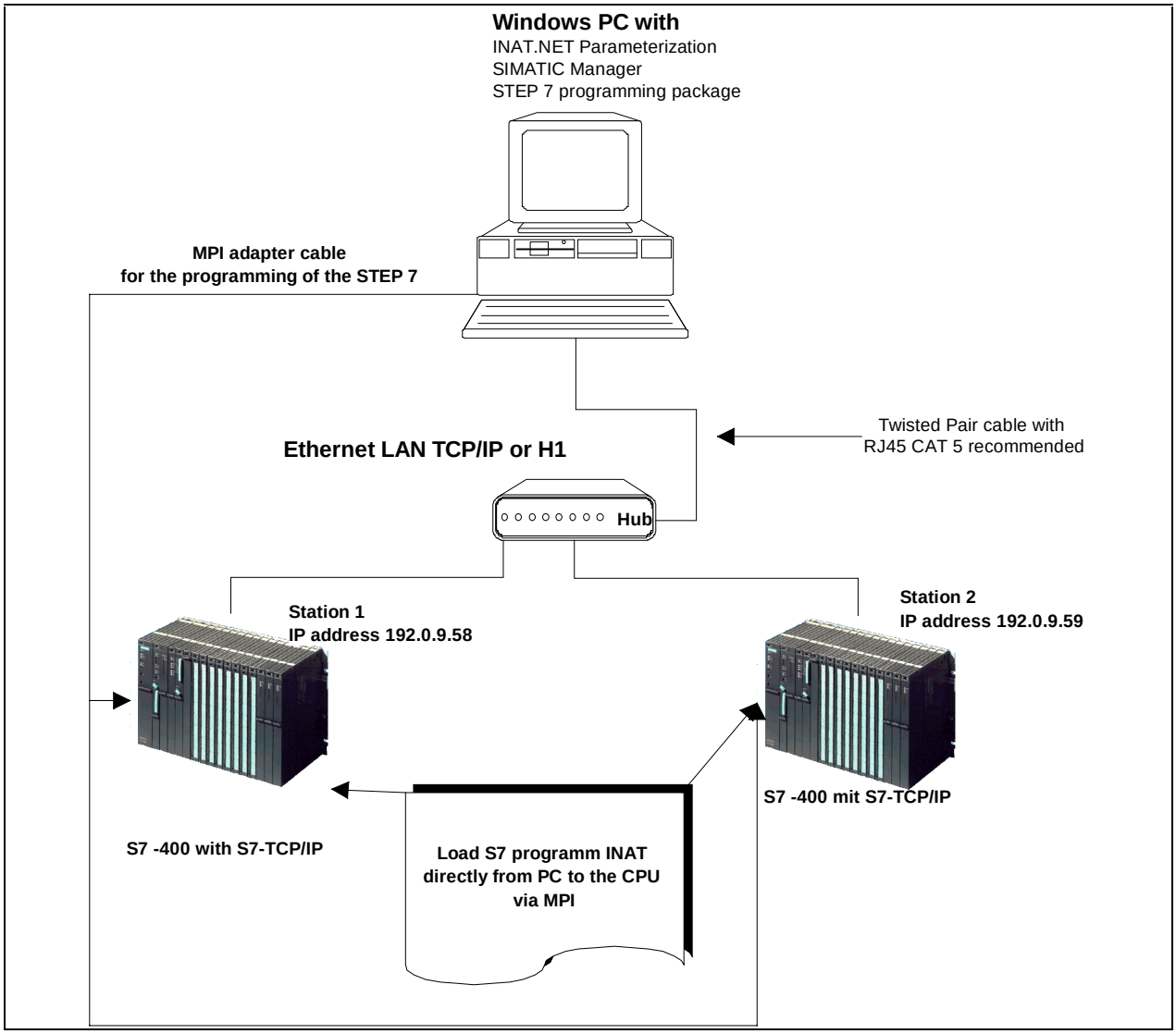


Figure 2-5: System layout for our example

Tasks for the PC

- Install the parameterization software.
- With the parameterization software you configure the two S7-TCP/IP communications processors S7-TCP/IP.
- From the PC side the blocks are loaded via STEP 7 and the SIMATIC manager to the S7 CPU. **At the moment you still need the MPI cable described above, because programming via network is not yet being supported.**

Flow chart for Send/Receive Direct Example

INAT S7-TCP/IP Ethernet interface for the S7-400

Requirements
- Installed INAT parameterization
- Installed STEP 7 software
- 2 S7 Racks with installed S7-400 CPU and INAT S7-TCP/IP
- Windows PC with network adapter

Start

Registration of the S7-TCP/IP in the LAN
Start the parameterization software. In the window "Select the station in the Network via TCP/IP" select your station with a double click. In the window "Edit station parameters" enter a station name, the IP address and subnet mask. Install the S7 meta files!

Registration of the INAT S7-TCP/IP in the SIMATIC Manager
In the HW configuration of the S7-400-station, select the module **INAT S7-TCP/IP-NET** in the directory CP 400.

Loading the S7 Project
Open the Send / Receive project on the hard disk under INATS7CP\Project\INAT. Start the S7 programme "INAT_Direct" in both controllers, involved in the communication.

Parameterizing the INAT CPs

Parameters of Station 1

[Own address]
Ethernet address=0021A0 06 00 01
Station name=Station1
Ip address=192.0.9.58
[Connection Send to Station 2]
Job number=2
Type of Job=Send
Ip Dest station=192.0.9.58
Ip Port=8888
Connection establishment=active
Ip protocol=TCP

Parameters ofStation 2

[Own address]
Ethernet address=0021A0 06 00 02
Station name=Station2
Ip address=192.0.9.59
[Connection Rec from Station 1]
Job number=3
Type of Job=Receive
Ip Dest station=0.0.0.0
Ip Port=8888
Connection establishment=passive
Ip protocol=TCP

Monitoring the transmission in the STEP 7 project
Open the VAT1 modules in your programm and select "monitoring online". Now the send and receive data should change.

End

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Tasks for the S7 controll

- Data words DW 0 to DW 10 are stored in data blocks DB 8 and DB 9. Via the communications processors, these data words are read (DB 9) from the S7-CPU or written (DB 8) to the S7-CPU. In our project example the transmission takes place from station 1 to station 2.
- Transmission is bidirectional (i.e., both SEND DIRECT and RECEIVE DIRECT jobs are configured for the two communications processors).
- On the S7 side, handling blocks NET_WORK, NET_SEND, NET_RECV, NET_ALL, NET_RST, and NET_SYNC are used. The handling blocks required are all located in the example project.
- The related STEP 7 program is located on the CD-ROM in the directory **INATS7CP\Project** under the name **INAT.**
- If you have loaded the project, all handling blocks needed for our example are listed in the "Block list" of the "STEP 7 SIMATIC Manager".
- Load the blocks of the S7 program "**INAT-Direct**" to your CPU.

Note If you want to load the blocks to a existing project, pay attention that existing blocks are not being overwritten.

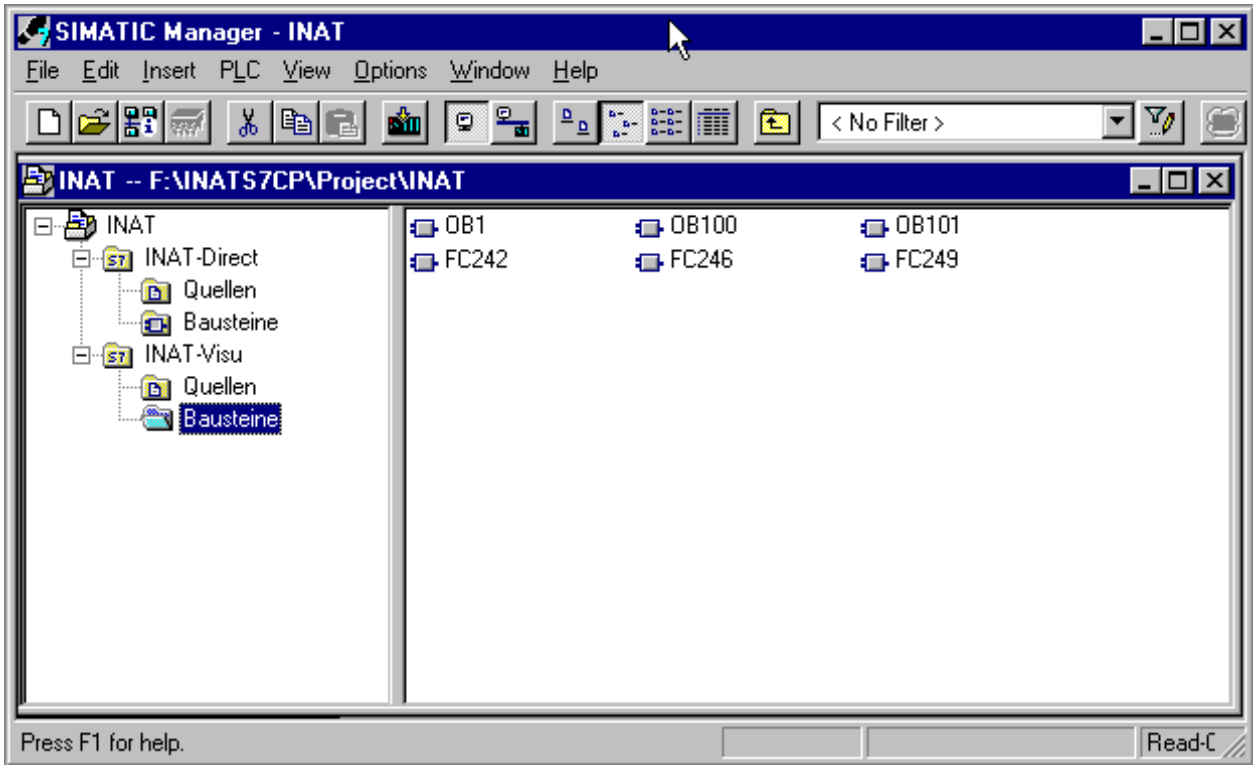

Figure 2-6: Block directory for our example

2.4.2 Blocks for the Synchronization

The interface to the S7-TCP/IP is synchronized by organization blocks OB 100 and OB 101 each time a automation system (AS) starts up. Depending on the type of interrupt, the following blocks are required for the subsequent startup:

OB 100	for manuel switchon
OB 101	for automatic startup after a power failure

Load handling blocks OB 100 and OB 101 (described in the figures below) to the AS.

```
OB100 :  "Complete Restart"
Comment:

Network 1: Page frame synchronization
The handling block NET_SYNC FC 249 should be called in both starting OBs(OB100
and OB101).

      CALL  "NET_SYNC"                  // NET_SYNC
       LADDR   :=512                    // Periphery byte of the INAT TCP/IP card
       SIZE    :=0                      // Block size, "0" for maximum
       ACT_JOBS:=2                      // Number of  active jobs
       ERROR   :=MB212                  // Parameterization error byte
```

Figure 2-7: Handling block OB 100 for synchronization of the S7-TCP/IP.

```
OB101 :  "Restart"
Comment:

Network 1: Page frame synchronization
The handling block NET_SYNC FC 249 should be called in both starting OBs(OB100
und OB101).

      CALL  "NET_SYNC"                  // NET_SYNC
       LADDR   :=512                    // Periphery byte of the INAT TCP/IP card
       SIZE    :=0                      // Block size, "0" for maximum
       ACT_JOBS:=2                      // Number of active jobs
       ERROR   :=MB213                  // Parameterization error byte
```

Figure 2-8 Handling block OB 101 for synchronization of the S7-TCP/IP.

NET_SYNC FC 249 is then called in OB 100 and 101 for synchronization of the S7-TCP/IP.

2.4.3 Blocks for SEND and RECEIVE

The SEND and RECEIVE calls must be included in the cyclic program portion of the S7 CPU. Since the S7 CPUs call block OB 1 when they branch to the cyclic portion, the NET_SEND and NET_RECV calls are best located there or called from there. In our example, NET_SEND and NET_RECV are triggered by blocks FC 200 and FC201.

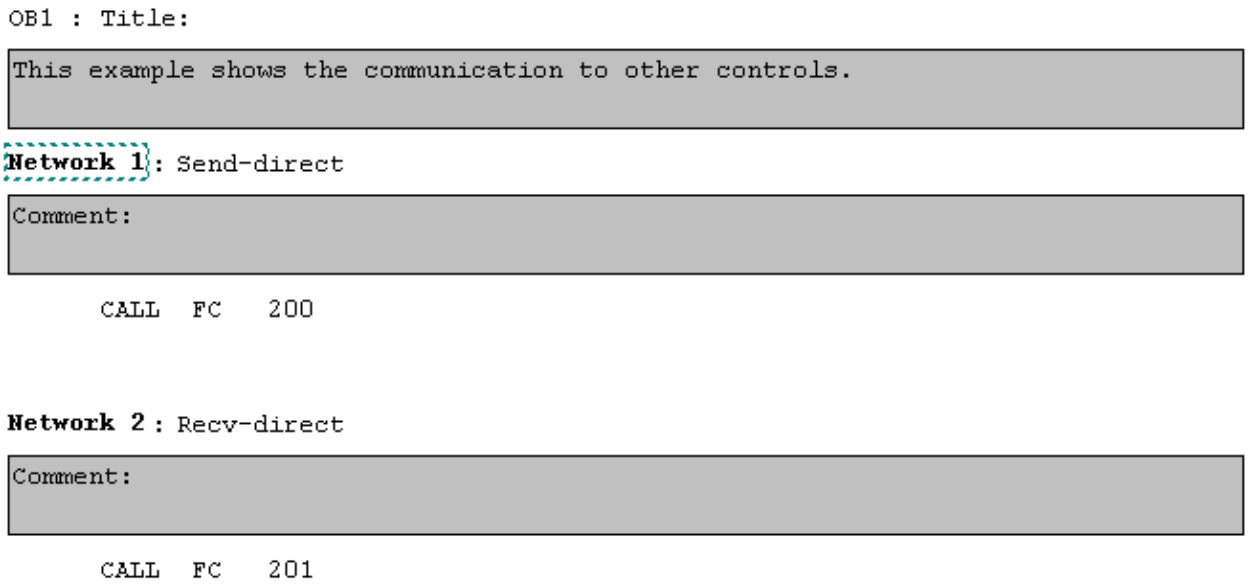

Figure 2-9: Organization block OB 1 (part 1)

FC200 and FC201 are called in OB1, where they then call the Send Direct and Receive Direct functions.

The NET_ALL function should be called at least once during the entire PLC programm.

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```
FC200 : Send Direct
Comment:

Network 1: NET_ALL
The block FC 246 should be called in the cyclic program.

      CALL  "NET_ALL"                 // NET_ALL
       LADDR :=512                    // Periphery byte of the INAT TCP/IP card
       STATUS:=MD200
       ERROR :=MB214

Network 2 : Start the sending job every 1 second.
You must not start the sending job in all the examples every second, excepting
this one.

      UN    T     1                   // Timer 1 s
      L     S5T#1S
      SE    T     1
      SPB   M000
      UN    M    100.0
      S     M    100.0                // Start the cyclic sending
      SET
      R     M    205.1                // Reset Job Running for starting NET_SEND

      L     DB8.DBW    0              // dynamic Send Data
      L     1
      +I
      T     DB8.DBW    0              // dynamic Send Data

M000: NOP   0

Network 3 : sending data from the own PLC and status request
Comment:

      UN    M    100.0                // start the job with this flags
      SPB   M001                      // skip, if Send is not started.

      UN    M    205.1                // if job is not running
      =     M    100.2                // Set the flag for ACT

      CALL  "NET_SEND"                // NET_SEND
       ACT       :=M100.2             //  M100.2 // TRUE for Start Send, FALSE for status request
       LADDR     :=512                // Periphery byte of the INAT TCP/IP card
       ID        :=1                  // Job number, declared in the Parameterization software
       NET_SOURCE:=P#DB8.DBX 0.0 BYTE 2 // Data area that will be send
       NET_DEST  :=#zero              // Any pointer, defined as a temporary variable
       STATUS    :=MD204
       ERROR     :=MB215

      UN    M    205.1                // If the job is not running any more, then
      R     M    100.0                // reset the flag for Start Send

M001: NOP   0
```

Figure 2-10: Function block FC 200 Send Direct

The Receive Direct Logic is stored in function block FC 201:

```
FC201 : Receive Direct

Comment:

Network 1 : NET_ALL

The handling block FC 246 NET_ALL sould be clalled in the cyclic program.

      CALL  "NET_ALL"                    // NET_ALL
       LADDR :=512                       // Periphery byte of the INAT TCP/IP card
       STATUS:=MD200
       ERROR :=MB216

      L     MW   220                     // Counter ready without errors
      L     MW   222                     // Counter ready with errors


Network 2: received data from the dest. PLC

The block FC 245 NET_RECV starts receiving job data with the parameterized
number "2".

      UN    M    209.1                   // Job is running
      =     M    100.1                   // invert Job Running for ACT

      CALL  "NET_RECV"                   // NET_RECV
       ACT       :=M100.1                //M100.1 // TRUE for Start Receive, FALSE for status request
       LADDR     :=512                   // Periphery byte of the INAT TCP/IP card
       ID        :=2                     // Job number declared in the Parameterization software
       NET_SOURCE:=#zero                 // Any pointer, defined as a temporary variable
       NET_DEST  :=P#DB9.DBX 0.0 BYTE 2 // Storage area of the received data in the own PLC
       STATUS    :=MD208
       ERROR     :=MB217

      UN    M    209.2                   // Ready without errors
      SPB   m001
// Include here the program for ranging and evaluating data

      L     MW   220                     // Counter ready without errors
      L     1
      +I
      T     MW   220

m001: NOP   0

      UN    M    209.3                   // Ready with errors
      SPB   m002
// The connection is not parameterized or not established
// or a transfer error occures

      L     MW   222                     // Counter ready with errors
      L     1
      +I
      T     MW   222

m002: NOP   0
```

2.4.4 Parameterization of Our Send / Receive Example

The only difference in the parameterization of stations 1 and 2 is the parameters to be set. The procedure is the same for both stations. The steps below apply to the parameterization of both stations. Remember that each station must be parameterized separately.

To parameterize the stations, perform the following steps for each station:

- If you have not already installed the parameterization software on your PC, do this now. For information on installation and program start, see chapter 4.1.
- Start the parameterization program.
  A dialog window appears offering you four ways to perform parameterization:

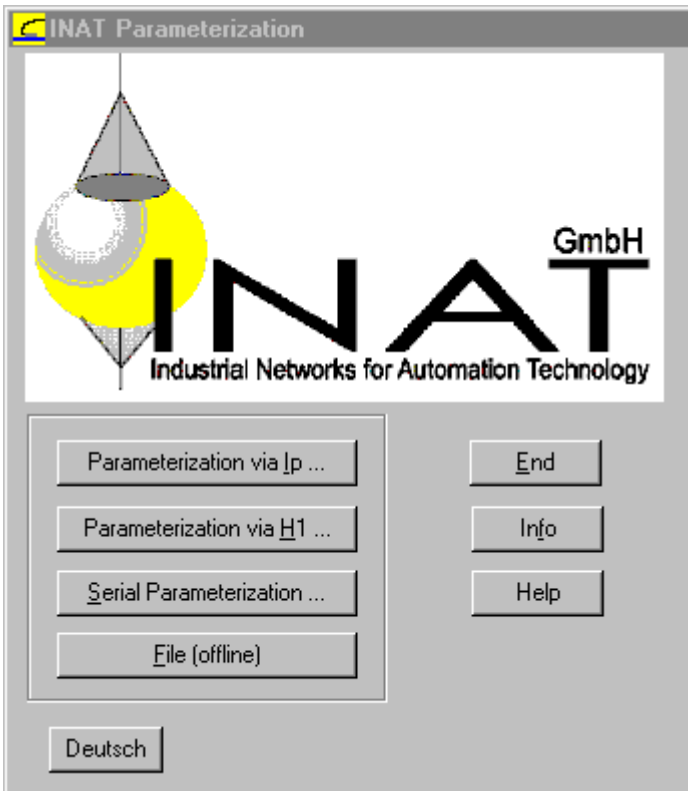

Figure 2-11: Selecting the parameterization

- Click "Parameterization via TCP/IP" with the mouse.
  A dialog window appears showing the stations which can be selected. If your two PLCs are the only two stations present in the network, only these two will be shown.

- If you are executing this example with new S7-TCP/IP modules, the TCP/IP addresses have not yet been set. You can find a detailed description in chapter 2.2. In our example the following station parameters were edited:

Station 1

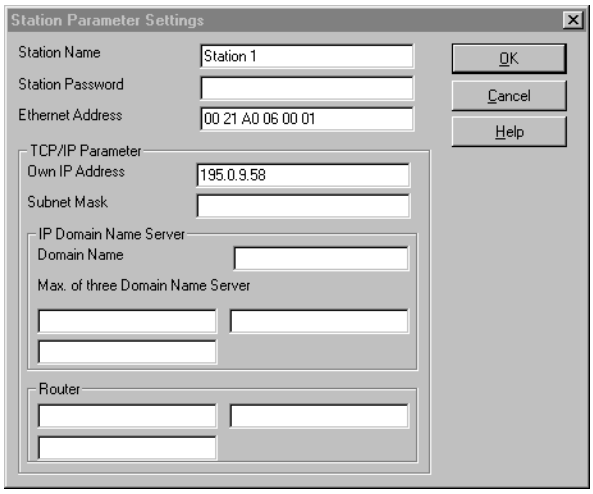

Figure 2-12: Editing the station parameters. Example: Station 1

Station 2

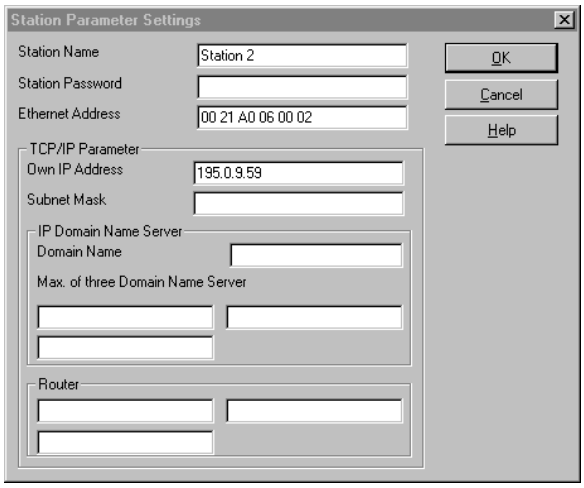

Figure 2-13: Editing the station parameters. Example: Station 2

- This stations should be online now. Since the stations are online, they are preceded by an arrow.

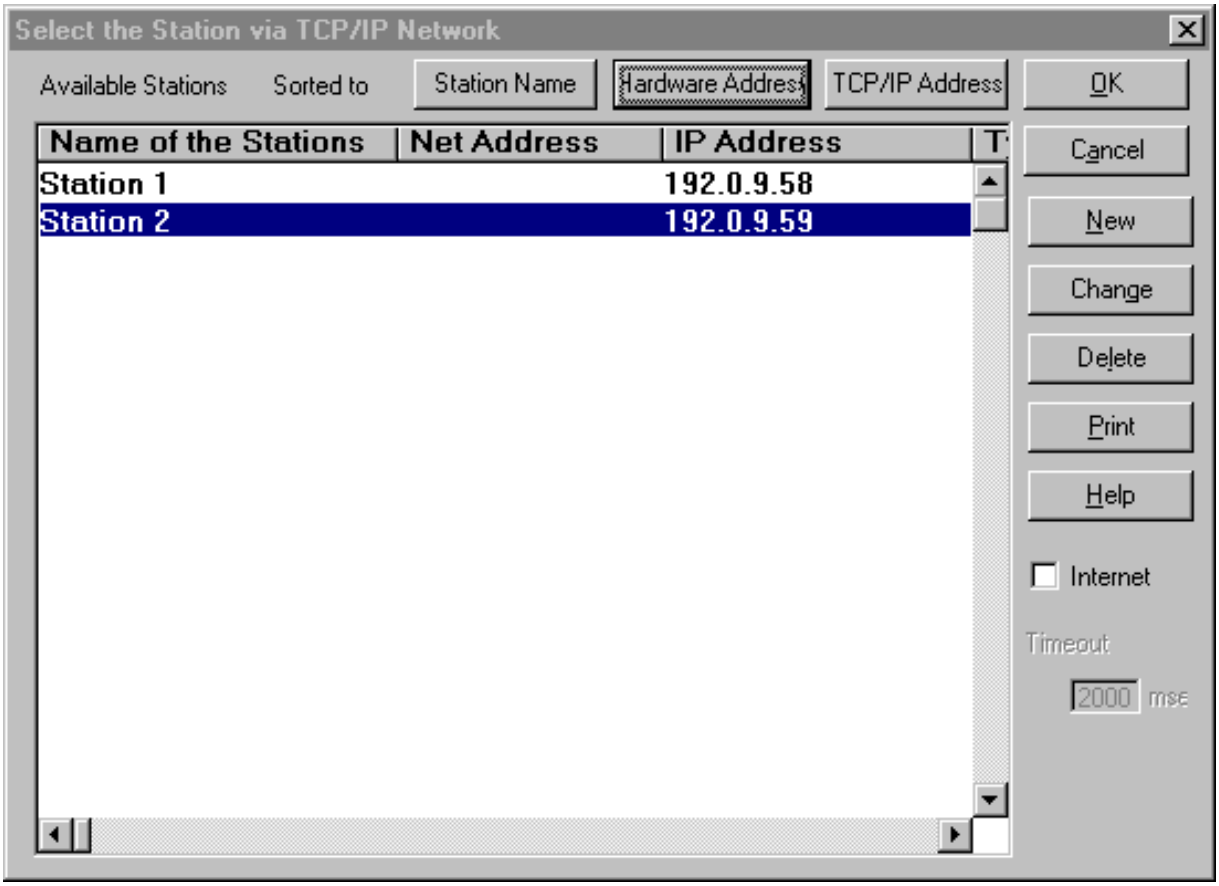

Figure 2-14: Selection of stations on the network after the first startup

- Using a single mouse click, select one of the stations to be parameterized, and click the OK button. The window for parameterization of the INAT S7-TCP/IP appears. If connections have already been parameterized for this station, these connections are shown. This window is blank when the parameterization program is started for the first time.

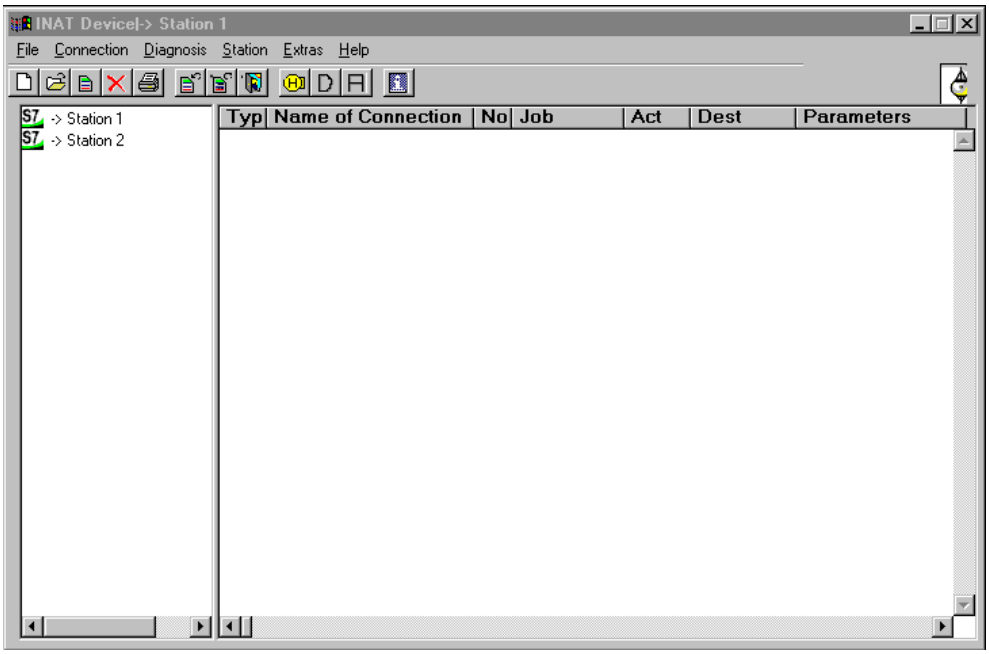

Figure 2-15: List of the current connections

- To parameterize a new connection, click "Connection/New..." in the INAT S7-TCP/IP connection window. The dialog window "New Connection" appears. Under "Name" for station 1, enter "Send to Station 2" and under "Name" for station 2, enter "Rec from Station 1 Under " Type of Connection", select the "TCP/IP" field and as "Protocol" select S7. Click OK.

Station 1 connections

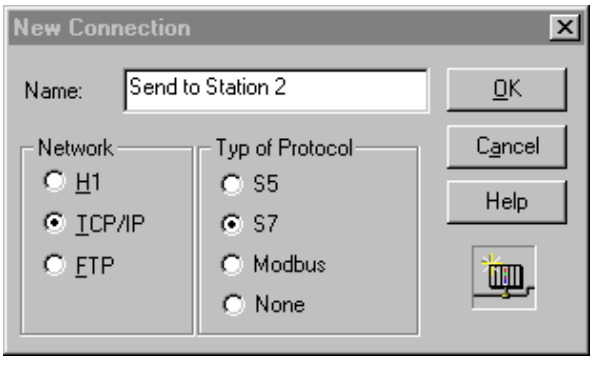

Figure 2-16: Send station 1, new connection

Station 2 connections

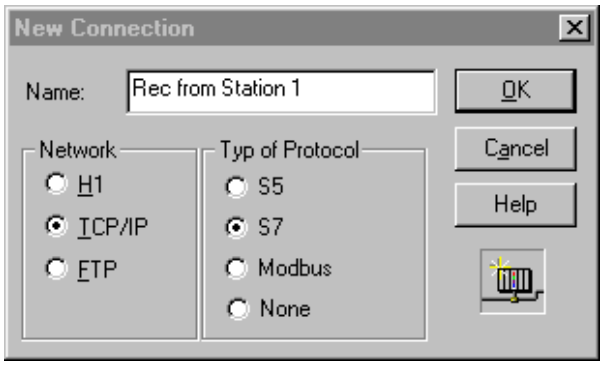

Figure 2-17: Rec station 2, new connection

- Under "Type of connection", select the "TCP/IP" field. Click OK.
  The "SPS Connection Settings " window appears.
- Enter the following values for the stations:

Editing PLC parameters – Send station 1

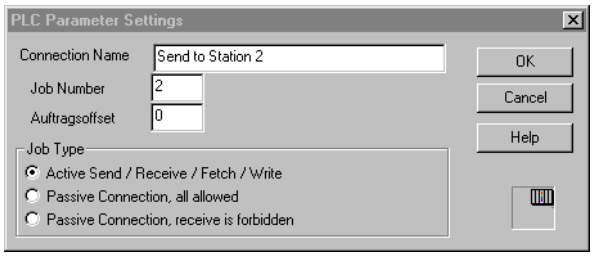

Figure 2-18: PLC parameters - Send station 1

Editing PLC parameters - Rec station 2

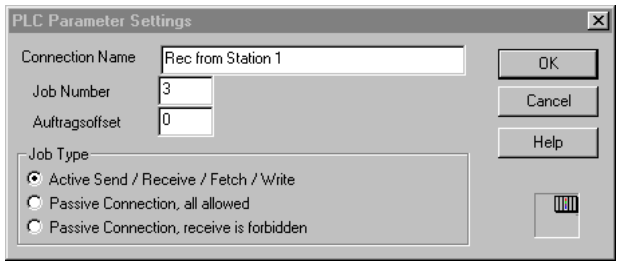

Figure 2-19: PLC parameters - Rec station 2

- Close the window with OK. The "TCP/IP Parameter Settings" window appears.

TCP/IP parameters - Send station 1

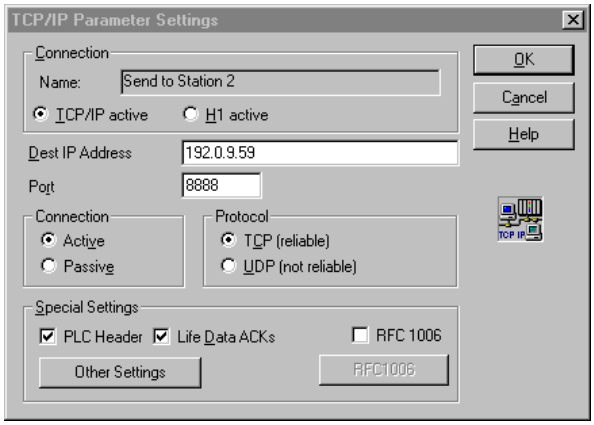

Figure 2-20: Editing TCP/IP parameters

TCP/IP parameters - Rec station 2

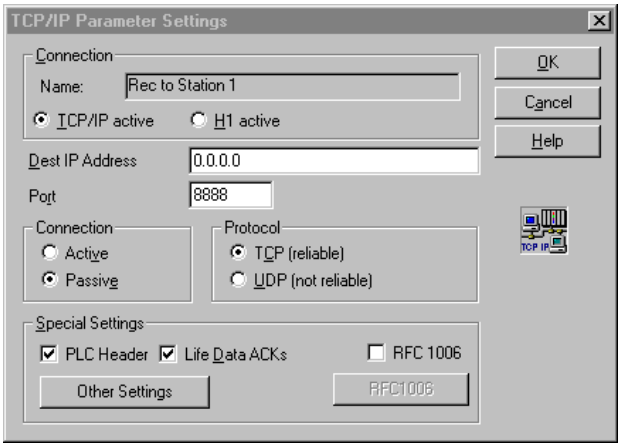

Figure 2-21: Editing TCP/IP parameters

- Remember that the Send/Receive connections of both stations must have the same port number "8888". The other settings are deafult values. They should only be changed if it is absolutely necessary.

- If you want to operate connections via H1 and you have activated H1 (see "New Connection" window above), the following windows appear. Enter the following values for the stations:

H1 parameters - Send station 1

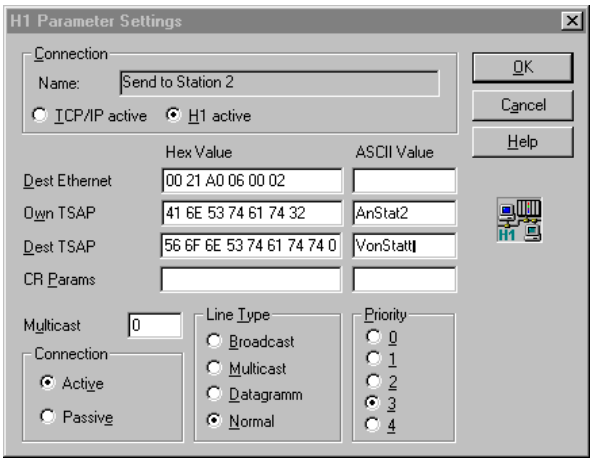

Figure 2-22: H1 parameters - Send station 1

H1 parameters - Rec station 2

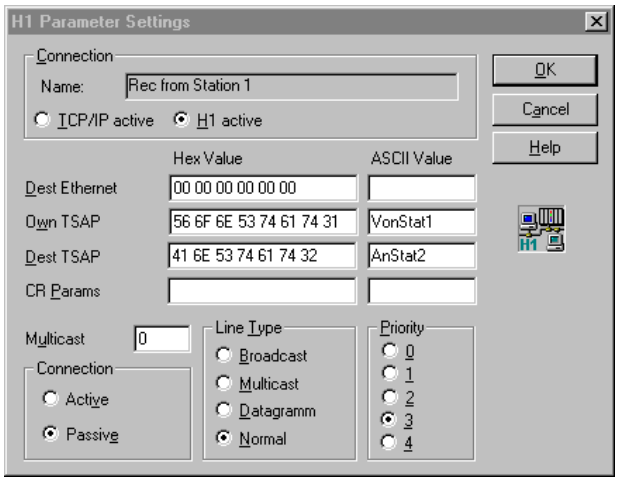

Figure 2-23: H1 parameters - Rec station 2

- After the entries have been made, click the OK button.
  The dialog window is closed, and the connections are now parameterized. You are now back in the parameterization window.

The parameterization window shows the new connections.

Connection list - Station 1

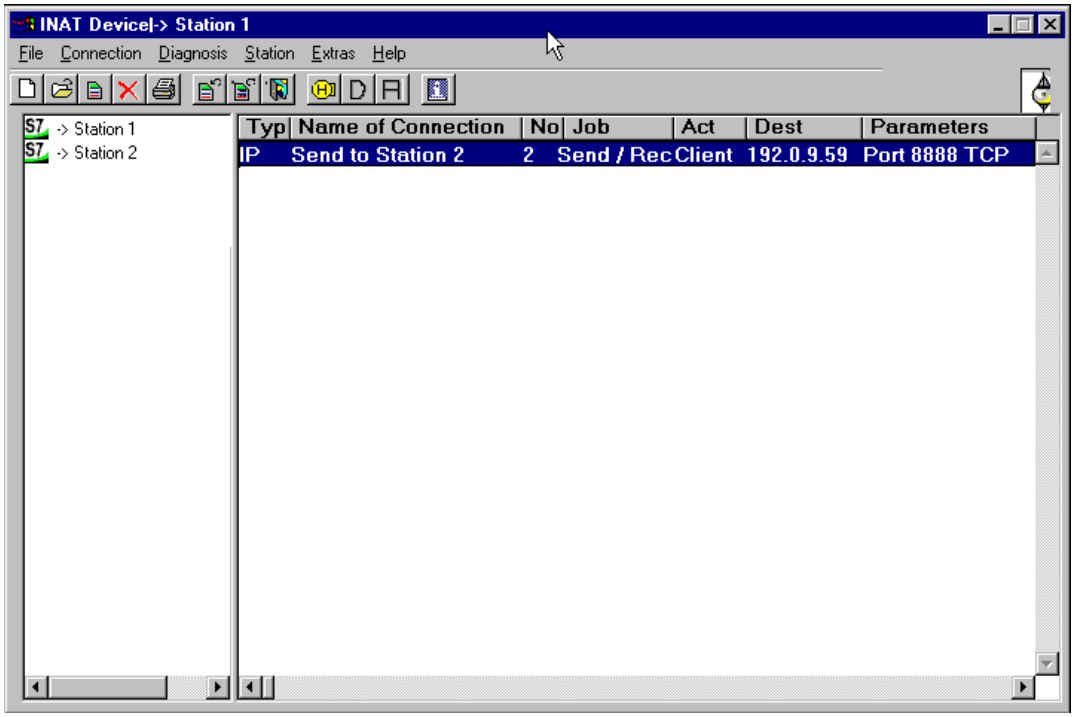

Figure 2-24: Connection list - Station 1

Connection list - Station 2

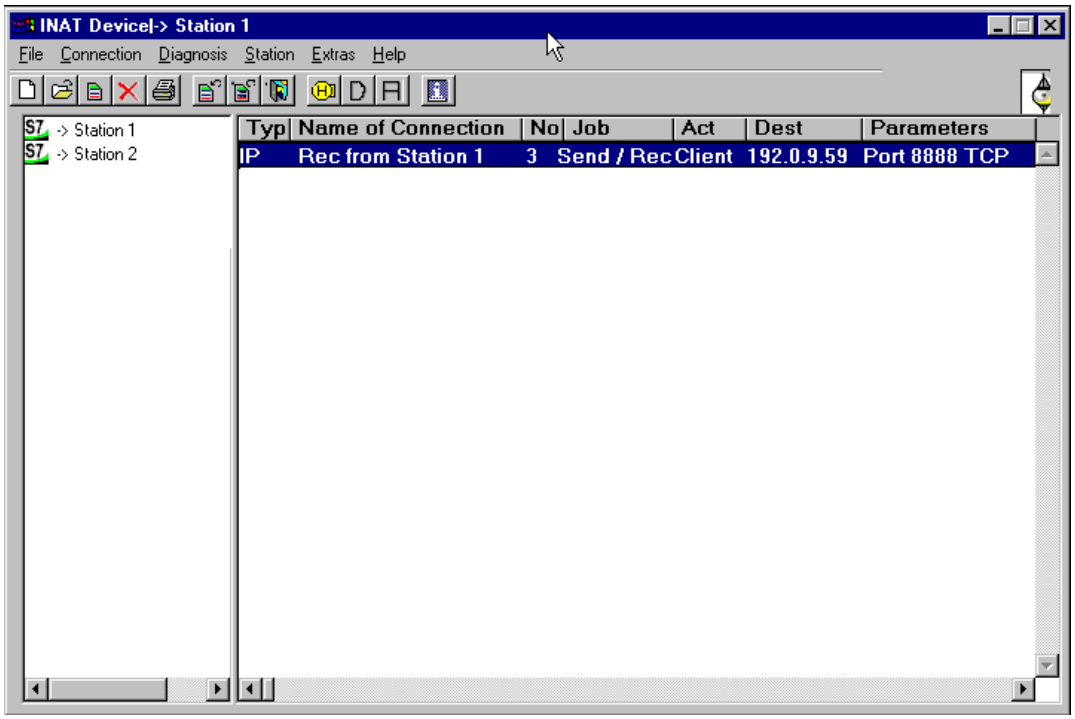

Figure 2-25: Connection list - Station 2

- Close this dialog window.

The two connections are now parameterized on the S7-TCP/IP modules.

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2.4.5 Starting and Monitoring the Transmission

Both the modules and the CPUs should be parameterized for monitoring the connection jobs. This section describes how the communication processes can be monitored. Communication can be monitored in several ways.

- Monitoring the transmission with the STEP 7 package
- Monitoring one connection with the parameterization software
- Monitoring all connections with the parameterization software

2.4.5.1 Monitoring the Transmission with STEP 7 in Simatic Manager

The STEP 7 Program contains the so-called variable table for monitoring the transmission. This block lists the permanently changed sended (Station 1) and received (Station 2) data.

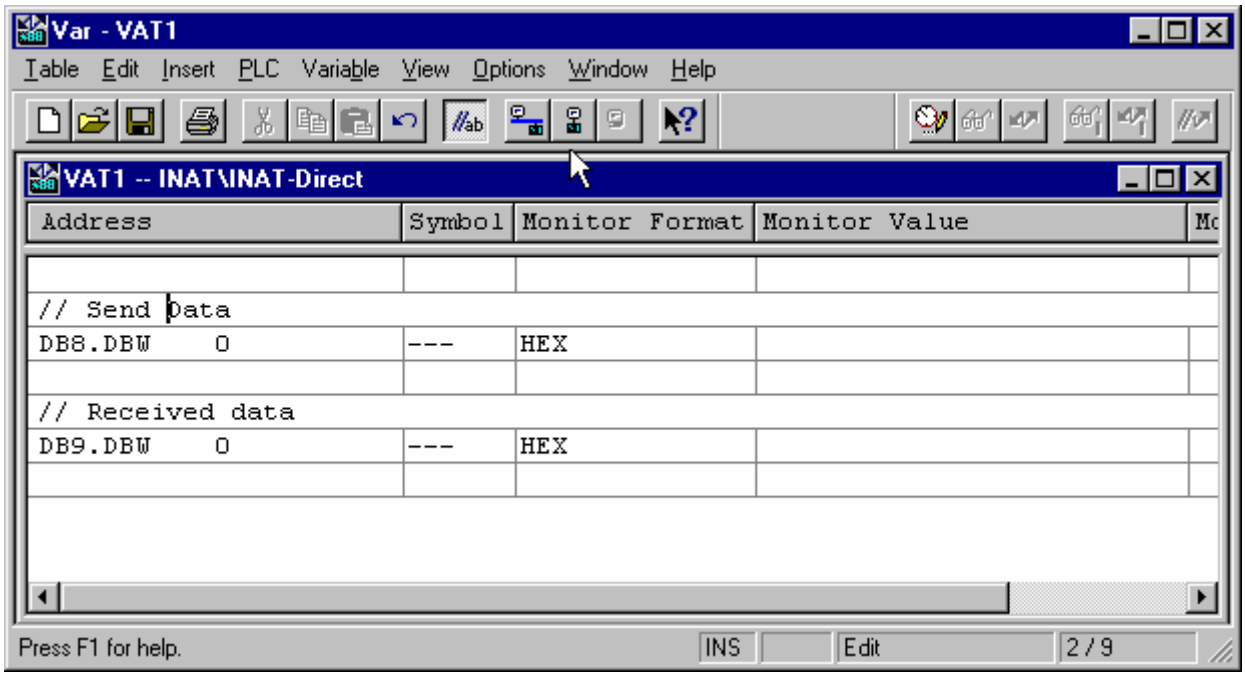

Figure 2-26: VAT block for monitoring the transmission with STEP 7 program

2.4.5.2 Monitoring One Connection on the INAT Parameterization

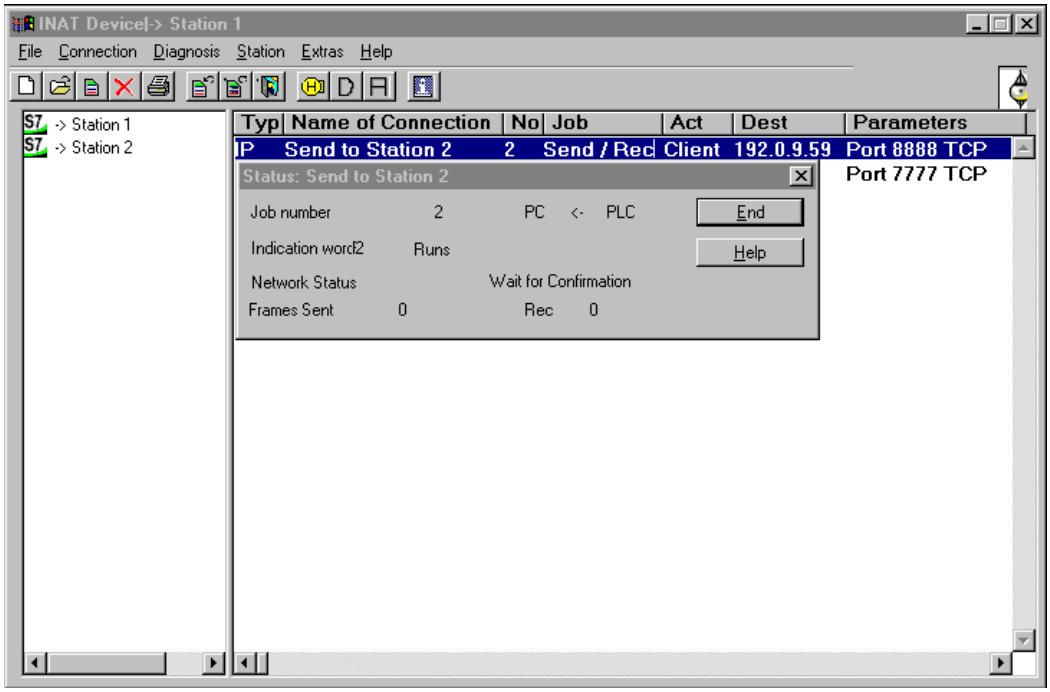

Figure 2-27: Monitoring one connection

You can use the Parameterization to monitor the transport connection between the two communication modules. This can be done on both the sender and the receiver side.

- Start the parameterization program.
- Click "Parameterization via TCP/IP and select "Station 1".
  To monitor one connection, select the connection "Send to Station 2" , and click "Online Indication".
- The name of the connection is indicated in the title line.
- The following values are output in this window:

"Job number"
A connection cannot be used by the S7 standard handling blocks unless it has been assigned a job number. The PLC program addresses the connection under this number.

Direction of the connection
The direction (i.e., from where to where) is indicated here. Particularly when the serial parameterization is being used, transmission errors become obvious when suddenly only one sending direction is indicated.

"Indication word"
The current indication word is shown in addition to the job number. If the connection has not been entered ("Automatic entry" has not been set), this is indicated in plain text.

"Status"
Since sending and reading can always be performed on a connection, the sending and read portions are monitored separately. The contents of the indication word is indicated in plain text, followed by the **number of frames** since the connection was started, and the **type of job.**

.

2.4.5.3 Monitoring Several Connections on the S7-TCP/IP

The INAT parameterization offers you the capability of monitoring several connections at the same time. Go to the parameterization window for connections.

- Click "Diagnosis / Monitor all connections...".

An output window appears indicating all connections and the related indication words.

Indication word
The current indication word is shown in addition to the job number .

0	Receive Job ready
1	SEND/FETCH Job running
2	Job finished (without errors)
3	Job finished (with error)

If the connection has not been entered ("Automatic entry" has not been set), this is indicated in plain text.

Network Status
Number of frames since the connection was started.

SEND / REC
Number of sent and read frames since the connection was started.

Anzw
The indication words are evaluated bitwise and are indicated in hexadecimal code.

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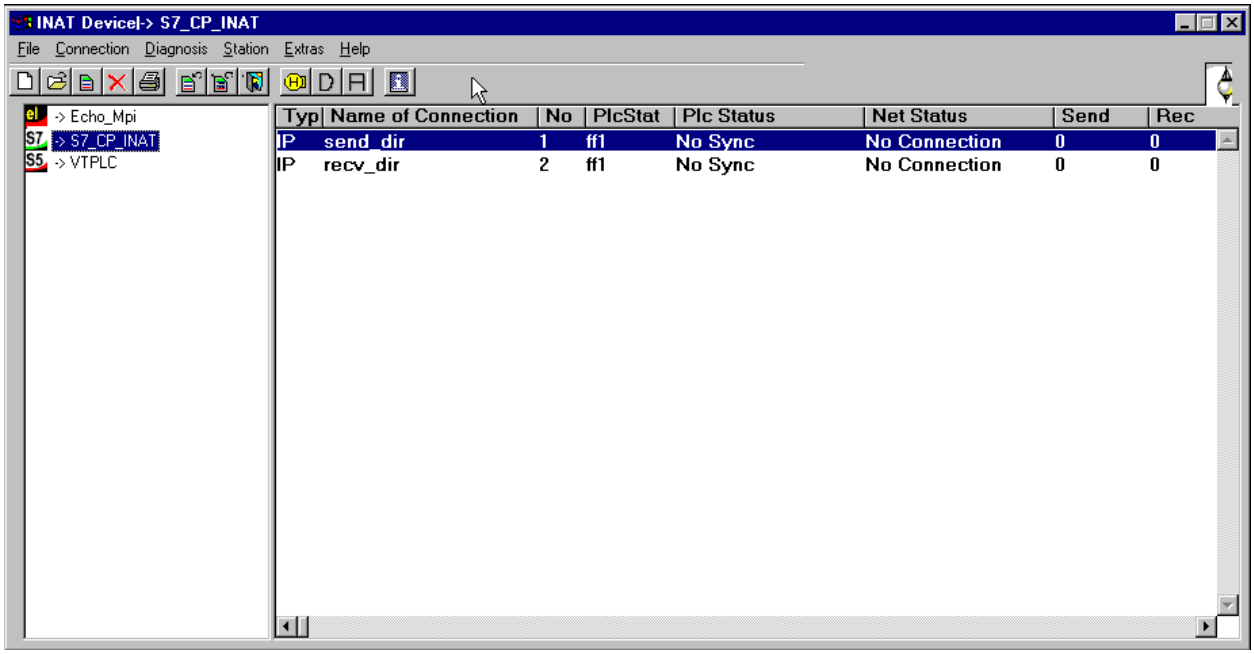

Figure 2-28: Indication words of all connection numbers of station 1

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2.5 Example for Fetch/Write Communication

2.5.1 Tasks to be Performed

This section describes how to structure a communication system. Data from the S7 shall be read from a process visualization via TCP/IP network. The figure bellow shows the system layout for this example.

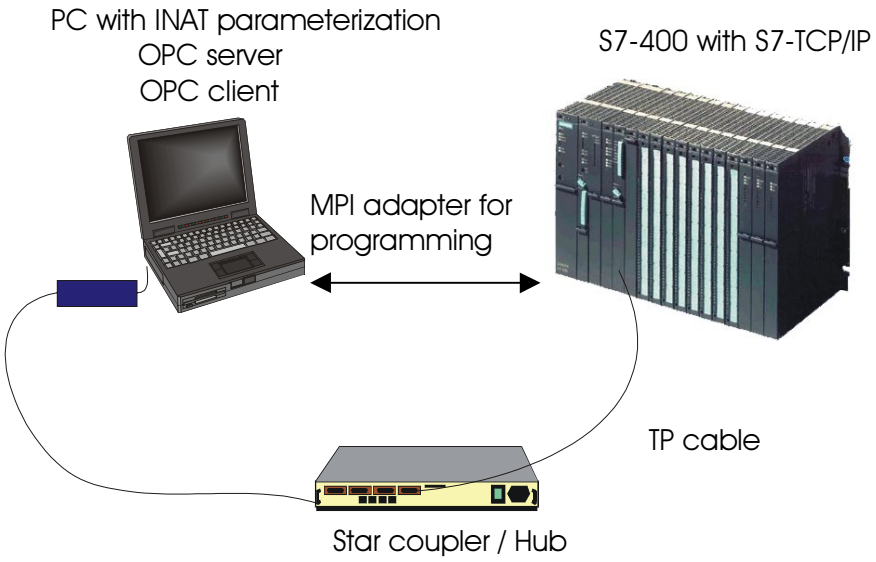


Figure 2-29 System layout for the Fetch / Write example

Tasks for the PC

- Install the parameterization software as described above.
- With the parameterization software you configure the two S7-TCP/IP communications processors.
- **Install**
- From the PC side, data are read via STEP 7 and SIMATIC Manager to the S7-CPU. **At the moment you still need the MPI cable described above, because the programming via the network is not yet being supported.**

Tasks for the AS

- The data words DW 0 to DW 10 are stored in data block DB 7 which are provided by the communication processor via a Fetch Passive job
- The communication from the CPU to the communications processor is handled by the help of a storage, that may be edited from both systems (Dual Port RAM) and provides a fast data exchange between the two modules. On the software side the communication is realized by the help of the communication blocks.

Flow chart for Fetch/Write Example

Requirements
- Installed INAT parameterization
- Installed STEP 7 software
- S7 Rack with installed S7-400 CPU andINAT S7-TCP/IP
- Windows PC with network adapter
- Installed INAT OPC server
- Installed INAT OPC client

Start

INAT S7-TCP/IP Ethernet interface for the S7-400

Registration of the S7-TCP/IP in the LAN
Start the parameterization software. In the window "Select the station in the network via TCP/IP", select your station with a double-click. In the window "Edit station parameters" enter a station name, the IP address and subnet mask. Install the S7 meta files!

Registration of the INAT S7-TCP/IP in the SIMATIC Manager
In the HW configuration of the S7-400 station select the module
INAT S7-TCP/IP-NET
in the directory CP 400!

Loading the S7 project
Open the project on the CD-ROM under INATS7CP\Project\INAT. Start the S7 programm "INAT_Visu" in both conbtrollers, involved in the communication.

Parameterizing the INAT S7-TCP/IP

Connection Tank 1 FetchWrite]
Job number=4
Type of Job=Fetch passive
Ip Dest station=0.0.0.0
Ip Port=7777
Connection establishment=passive
Ip protocol=TCP

Request data in the OPC client
Open the client of the company Rockwell.
Add Group Parameter "INAT"
Add Access Path "Tank 1"
Add Item"db7,w0"

Parameterizing the INAT OPC server
[Access Path Definition]
Name=Tank1
S7 connection
Ip Dest station=192.0.9.58
Ip Port=7777
Connection establishment=aktive
Ip protocol=TCP
Read and write with one connection

Result in the server

End

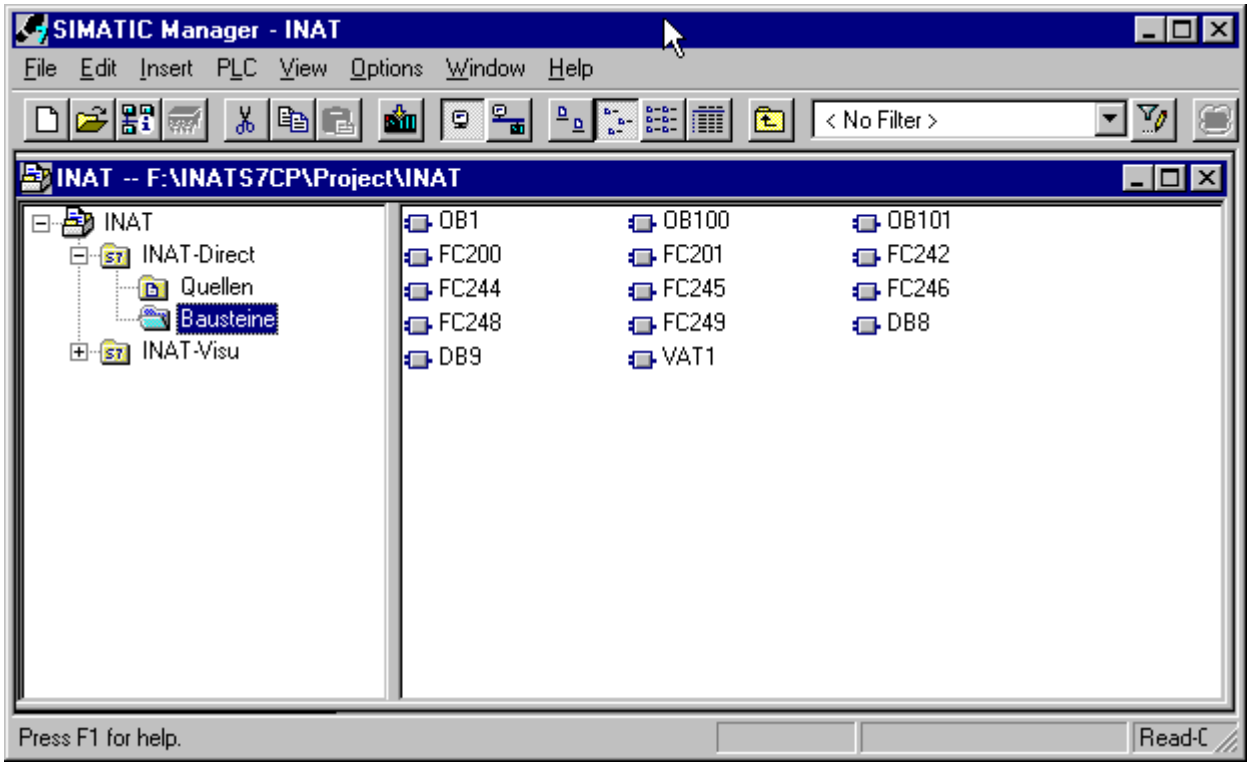
0101-001

The types of jobs are NET_SYNC and NET_ALL. The internal communication block FC 242 NET_WORK always has to be available in the CPU.

Number of the block	Identifier	Description
FC 242	NET_WORK	Internal block, it is required from the control for the communication.
FC 246	NET_ALL	It is necessary for the background communication. It is responsable that all communication partners receive data if they request for them.
FC 249	NET_SYNC	Synchronises the CPU of the PLC and the communications processor

Note The related STEP 7 program is located as project on CD-ROM in the directory **INATS7CP\Project\INAT** under the name **INAT-Visu**.

- After having loaded the project, Step 7 SIMATIC Manager lists all handling blocks required for this example in the „block directory“.



- Load this blocks to the CPU

Note If you want to load the blocks to a existing project, pay attention that the existing blocks are not being overwritten.

Synchronization of the S7-TCP/IP

0101-001

NET_SYNC has to be called at warm start or cold start. OB 100 and OB 101 are the blocks for the warm start and cold start, with which the synchron block FC 249 is called.

```
OB101 :  "Restart"
Comment:

Network 1: Page frame synchronization
The block FC 249 should be called in both starting OBs (OB100 and
OB101).

     CALL  "NET_SYNC"
      LADDR    :=512                    // Periphery byte of the INAT TCP/IP card
      SIZE     :=64                     // DPR size
      ACT_JOBS:=2                       // Number of running conections
      ERROR    :=MB250                  // Parameterization error byte
```

Figure 2-30: Organisation block OB 100 with initialisation of the synchron block

```
OB101 :  "Restart"
Comment:

Network 1: Page frame synchronization
The block FC 249 should be called in both starting OBs (OB100 and
OB101).

     CALL  "NET_SYNC"
      LADDR    :=512                    // Periphery byte of the INAT TCP/IP card
      SIZE     :=64                     // DPR size
      ACT_JOBS:=2                       // Number of running conections
      ERROR    :=MB250                  // Parameterization error byte
```

Figure 2-31: Organisation block OB 101 with initialisation of the synchron block

The NET_ALL call mest be included in the cyclic program portion of the S7 program. Since the S7 CPUs call block OB1 when they branch to the cyclic portion, the NET-ALL call is best located there.

OB1 Cyclic call of the NET_ALL block

```
OB1 : Communication with visualization
This type of communication is used in connection with a visualization.

Network 1: NET_ALL
The block FC 246 should be called in the cyclic program.

     CALL  "NET_ALL"
      LADDR :=512
      STATUS:=MD246
      ERROR :=MB251
```

Figure 2-32: Cyclic call of the NET_ALL block

Note

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Beside the organization and the communication blocks described above, the data blocks to be transferred should also be stored in the PLC.

2.5.2 Parameterization of our Introductory Example

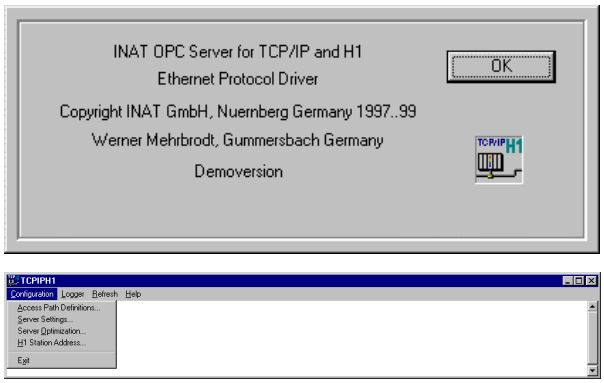
The parameterization procedure of the PC and the PLC is the same. The steps below apply to the parameterization of both stations. Remember that each station must be parameterized separately.

First set up your network. To parameterize the stations, perform the following steps for each station (**Note**: on the left side there are the entries for the OPC server and on the right side there are the entries for the parameterization program of the S7-TCP/IP).

Server TCP/IP & H1 OPC

If you have not already done so, install the OPC Server on your PC now. See chatpter 3 for information in installation ans starting the program.

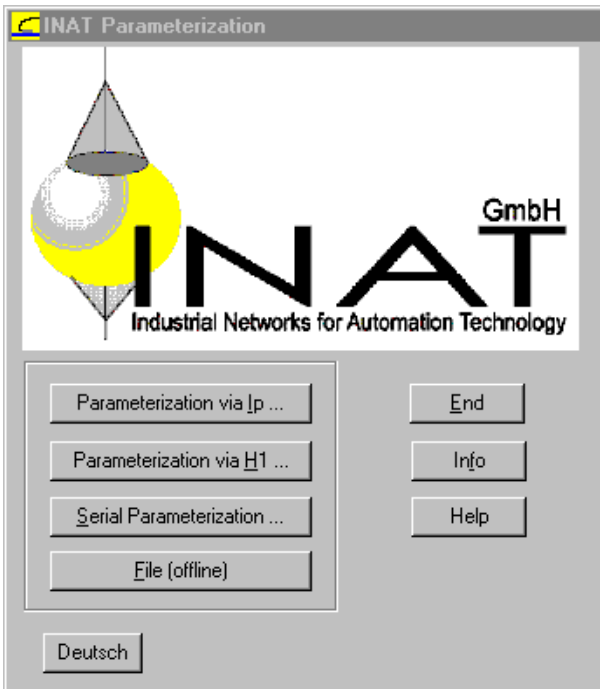
Start the OPC server. In the menu "Configuration“, select menu item "Topic Definition."



S7-TCP/IP Parameterization

If you have not already done so, install the parameterization software on your PC now.

Start the parameterization program. A dialog window appears offering four methods of parameterization:



Click "Parameterization via IP..." with the mouse. A dialog window appears with a selection of available stations. H1 stations are also shown. If only one AS station exists in the network, only this one station is shown.

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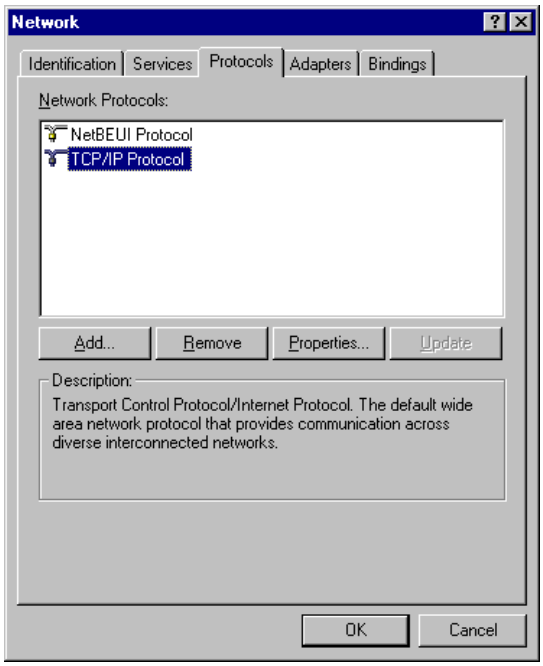
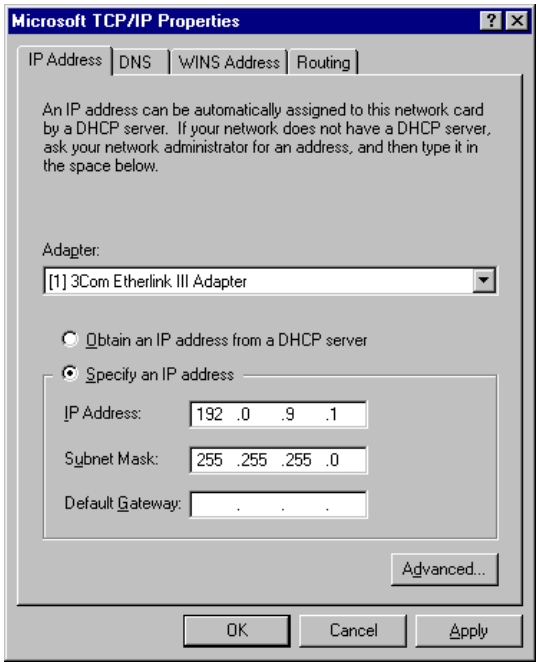
TCP/IP & H1 OPC Server

Parameterizing the Station

Note

If you have not already done so, set the IP address of your PC under NT. In the menu "Start/Settings/Control Panel/Network", enter the following values in the "Protocols/Properties" window for the IP address and the subnetwork mask. Then start the OPC server again.



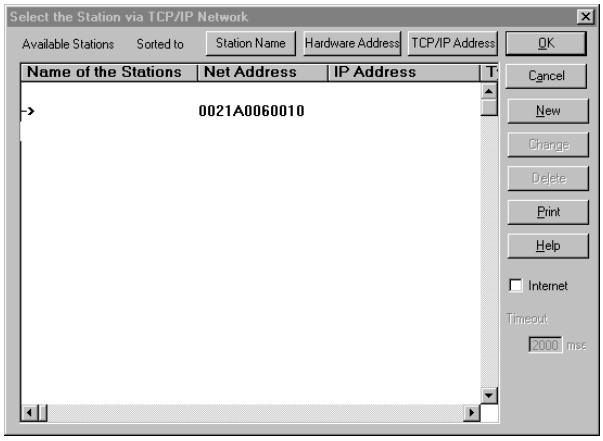


S7-TCP/IP Parameterization

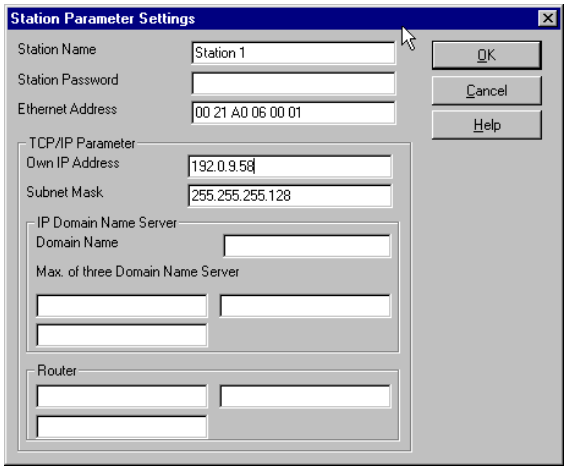
Parameterizing the Station

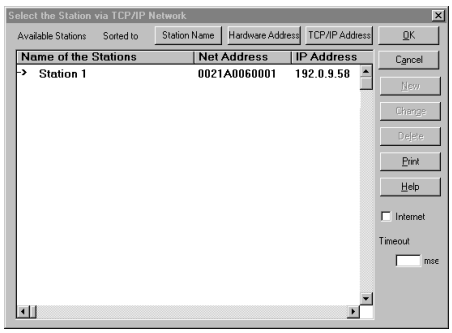
Note

If you will be executing this example with new S7-TCP/IP modules, the station name and the TCP/IP addresses have not yet been set. Only the Ethernet address is assigned in the "Select the station in the network“ window.



Select a station with a double click. The dialog window "Station Parameter Settings" appears in which the following parameters are entered:





Online stations are identified by an arrow in front.

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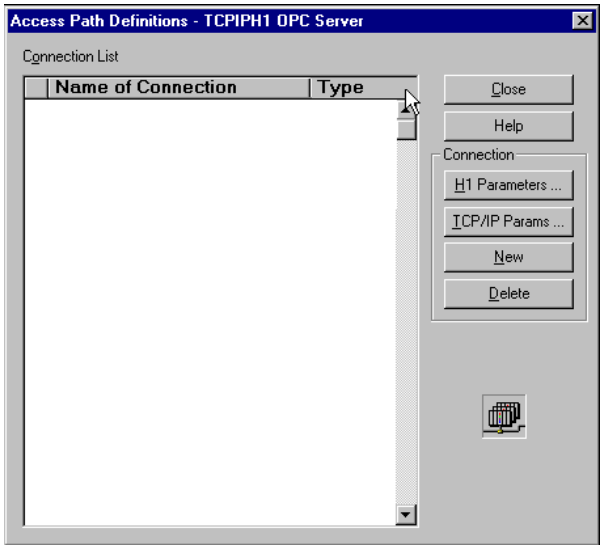
Parameterize a New connection

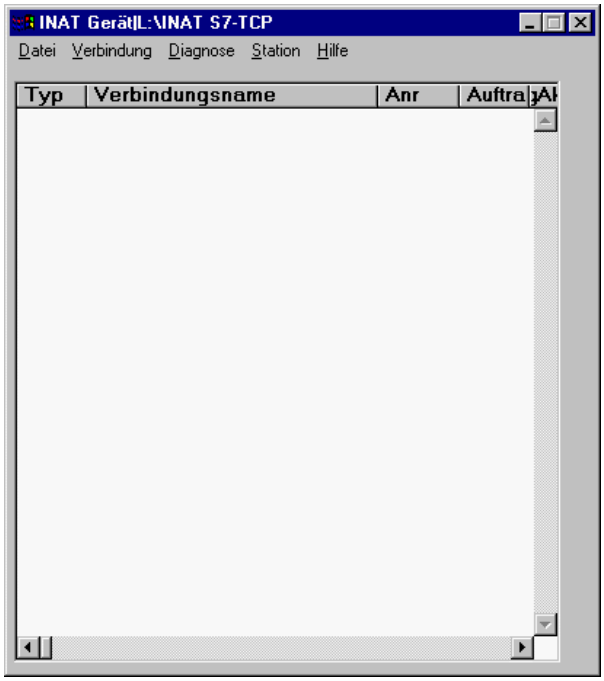
After selection of the "Topic Definition" menu item, the window “Parameterizing INAT OPC server”



At this time, no connections have been parameterized. Click "New" to set up a new connection.

Parameterize a New connection

Click the OK button in the "Select a Station..." window to access the input mask "INAT S7-TCP/IP Connection list".



At this time, no connections have been parameterized. Click "Connection/New" to set up a new connection.

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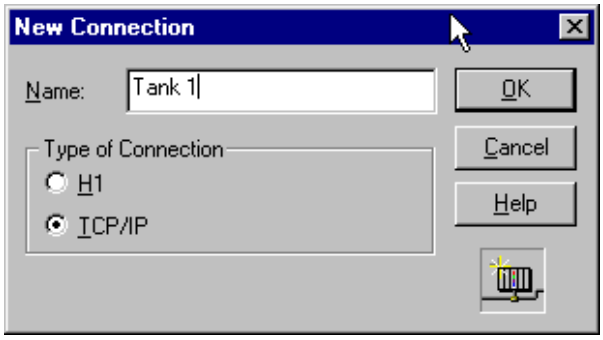
TCP/IP & H1 OPC Server



Under the connection name, enter the name (e.g., Tank 1) for communication with the controller, and select connection type TCP/IP.

S7-TCP/IP Parameterization

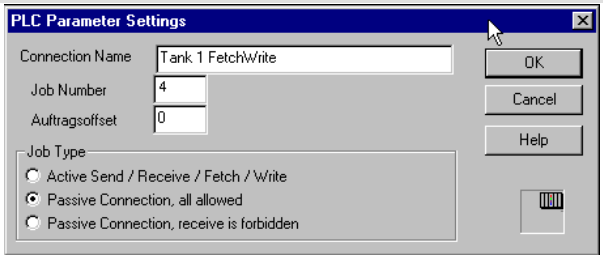
Under connection name, enter a name (e.g., "Tank 1 FetchWrite") for the response to the visualization PC, and select connection type TCP/IP with the protocol header S7.

PLC Parameter VISU-PC

Click OK to directly access the "TCP/IP Parameter Settings" mask on the OPC server. A separate dialog window for the PLC parameters does not exist since the "job number" and "job offset" parameters do not exist and the "job type" is specified.

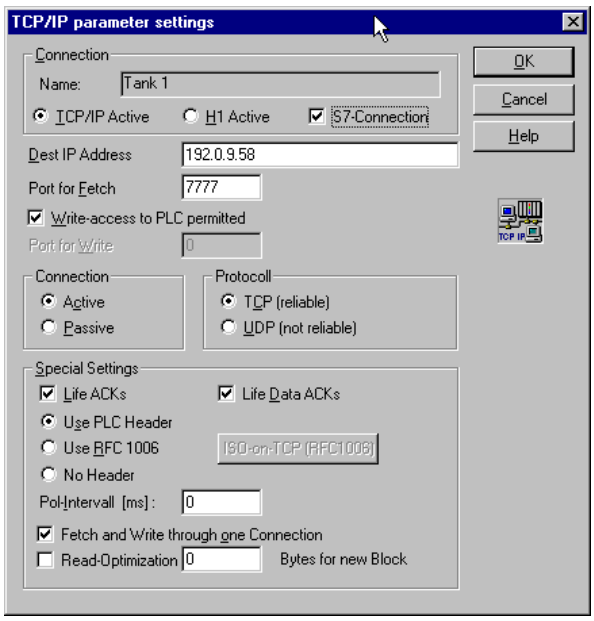
S7 Parameter PLC

Click OK to open the "Editing PLC parameters“ window. The PLC parameters control the connection between the S7-TCP/IP module and the S7 CPU. Select as job type "Read and write passive connection".



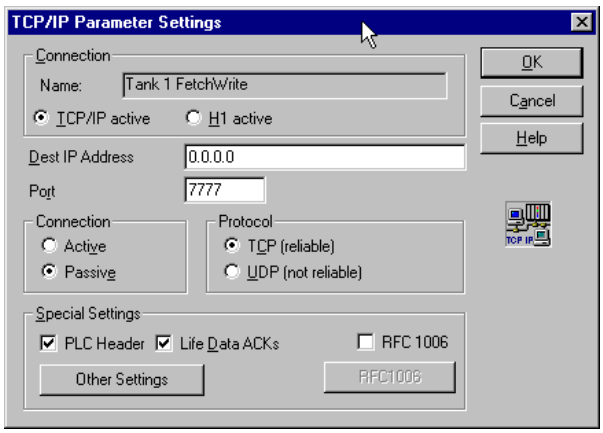
TCP/IP & H1 OPC Server

"TCP/IP Parameter Settings"



S7-TCP/IP Parameterization

"TCP/IP Parameter Settings"

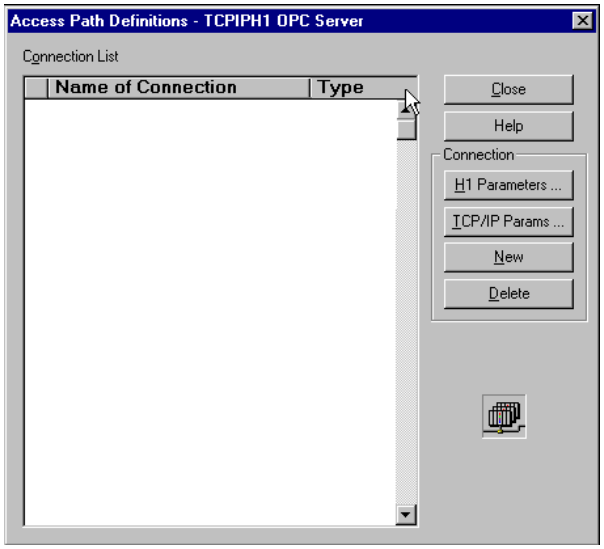


0101-001

TCP/IP & H1 OPC Server	S7-TCP/IP Parameterization

Connection list

Click the "Close" button. The dialog window for editing the TCP/IP parameters is closed. Since the connections have been parameterized, they appear in the connection list of the parameterization window.



Close this dialog window. The newly set up and parameterized connections do not take effect until a new start is performed for the OPC server.

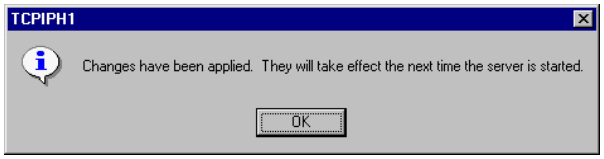
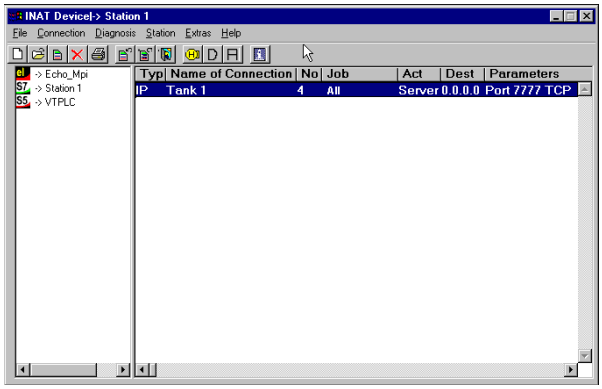


Figure 2-33: Note on new start

Exit the OPC Server and then start it again.

Connection list

Click the "Close" button. The dialog window for editing the TCP/IP parameters is closed. Since the connections have been parameterized, they appear in the connection list of the parameterization window.



The connections between the VISU PC and the PLC have now been parameterized!

2.5.3 Data Communication with an OPC Client

Load the OPC-Client "Rockwell" from the CD-ROM. Copy the exe-file to a directory of your choice and start the program by double clicking OPC Client.exe or with "Start/Execute/OPC Client.exe".

Start your OPC Client (e.g., the Rockwell OPC Client).

Select in the menu "OPC/ Connect" the correct installed "INAT TCPIPH1 OPC Server".

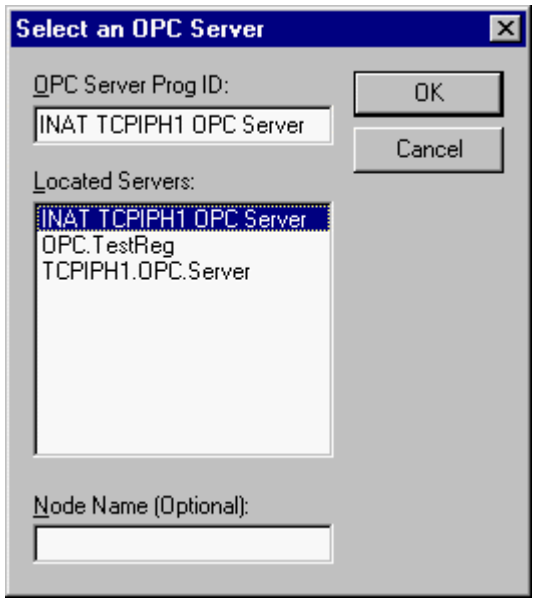


Figure 2-34: Selection of the OPC server

Add a new group in the menu Group/Add Group.

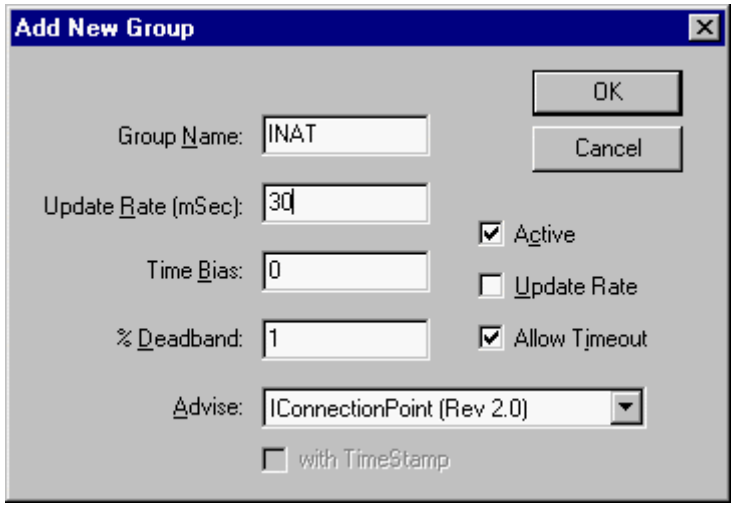


Figure 2-35: Selecting the group parameters

Under „OPC ADD ITEM“ enter the Access Path Name from the OPC server. Here it is Tank 1. The desired ITEM, here DB7DW0 has to be entered, too.

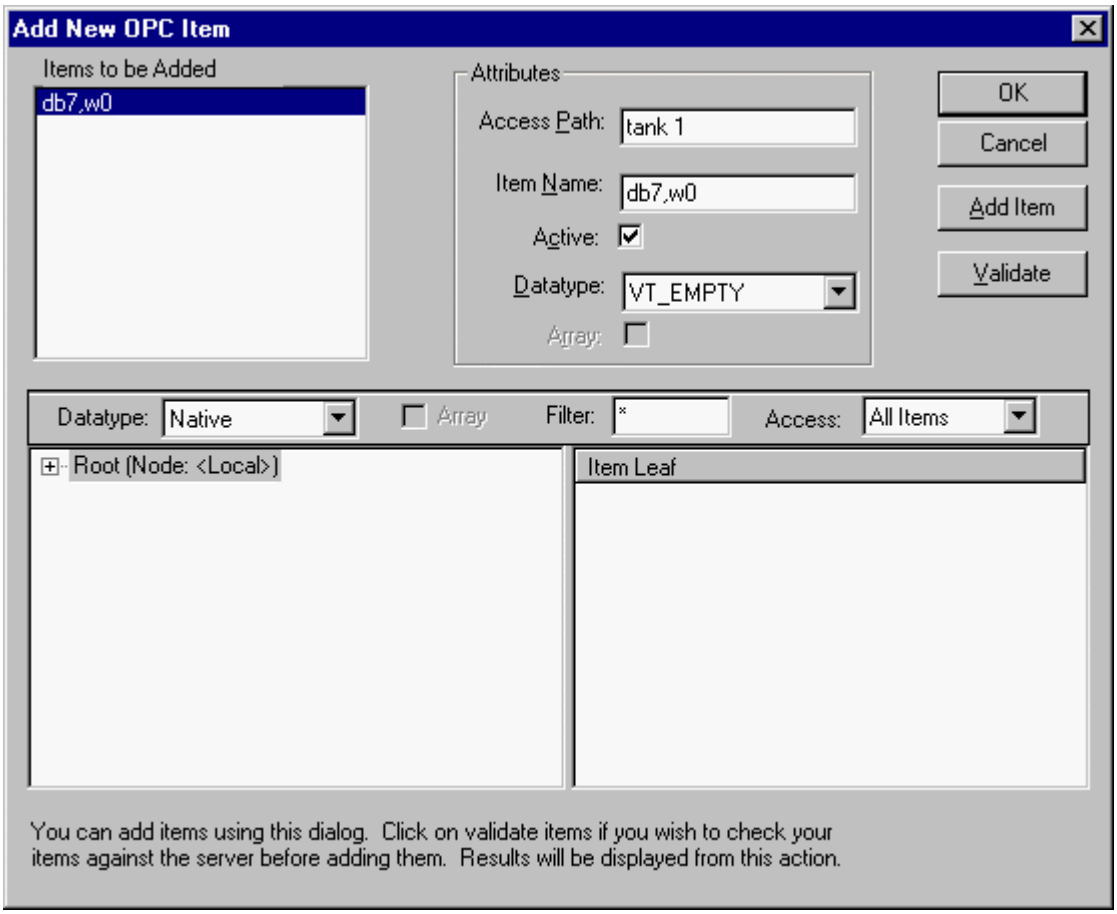


Figure 2-36: Input of the access path and the items of the OPC Client

If the control contains the data block DB7 and data word DW0, "Value" should show a permanently incremented value.

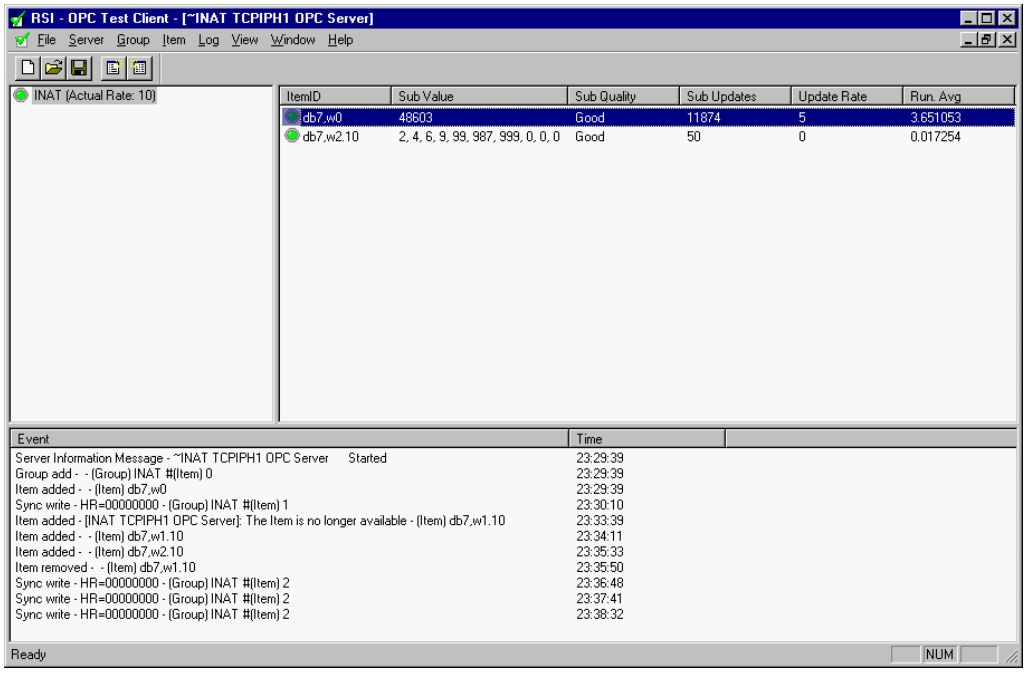
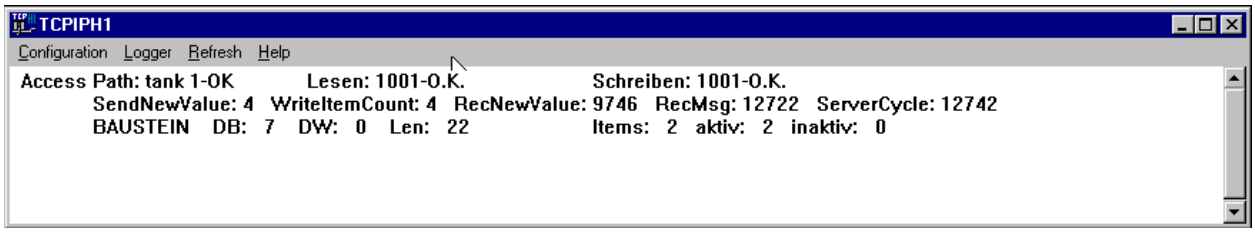


Figure 2-37: Results in the client

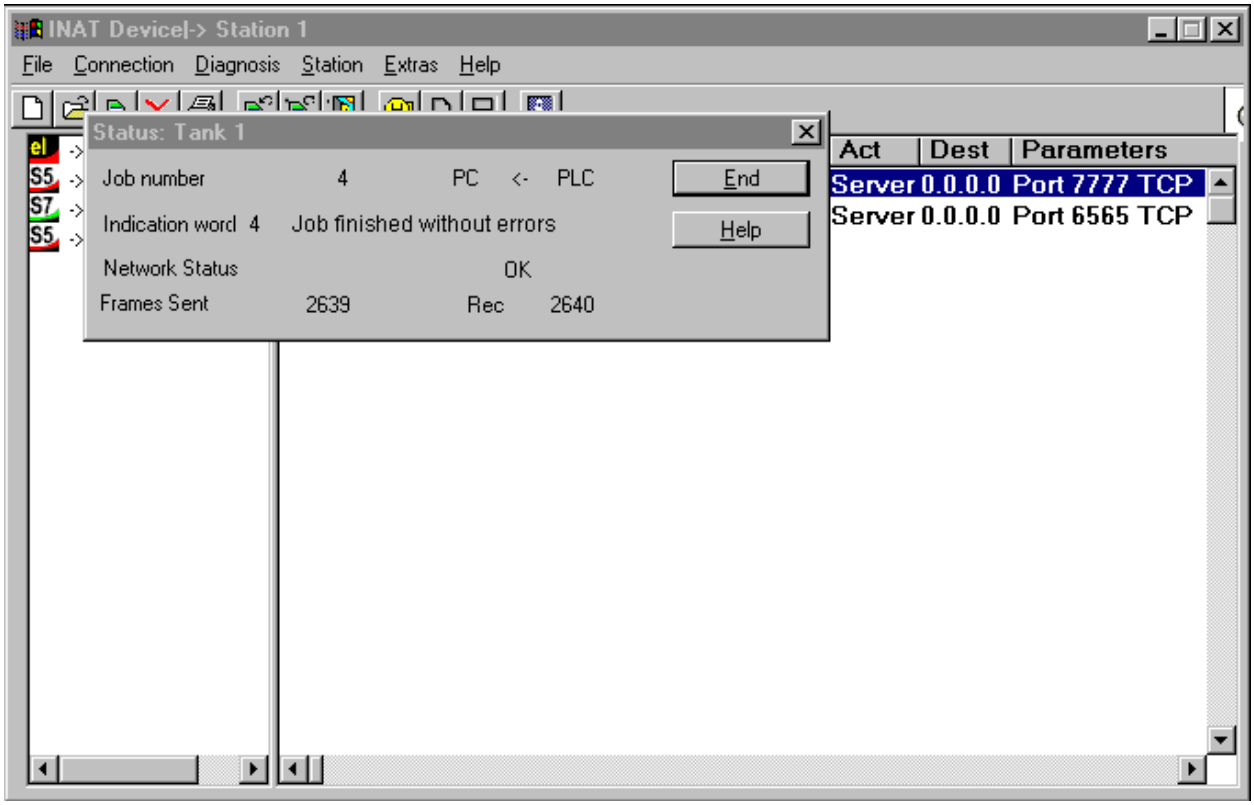
2.5.4 Results in Server

If the control contains the data block DB7 and the data word DW0, then the following entries should be shown in the main window of the OPC Server .



2.5.5 Online Diagnosis in the INAT.NET Parameterization

In the INAT Parameterization you monitore the communication by selecting "Diagnosis / Display Connection Status ".



3 Hardware

3.1 Connections and LEDs on the Front Panel

You can see the following interfaces on the front panel of the module

LEDs of the S7-TCP/IP	
Physical interface to the LAN	Link
Synchronisation with S7 CPU	Sync
Connection is established	Conn
Frame is sent	Tx
Frame on the network	Rx
Data receiving	Din
Data sending	Dout
At the moment not supported	PG
At the moment not supported	PARA
At the moment not supported	MPI

Memory Card

Interfaces
PG interface MPI, **at the moment without function**
Ethernet / AUI interface
Ethernet interface Twisted Pair

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3.2 Location of the Sockets, Plug Connectors and Jumpers

The following figure shows the primary components of the module:

- the AUI, TP and MPI interfaces for PG access to the S7,
- serial interface for the diagnosis of the module
- the interface to the S7-400 via the dual-port RAM,
- PCMCIA slot for the parameterization FLASH - ROM cards,
- Jumper for the selection of Flash-ROM / EPROM,

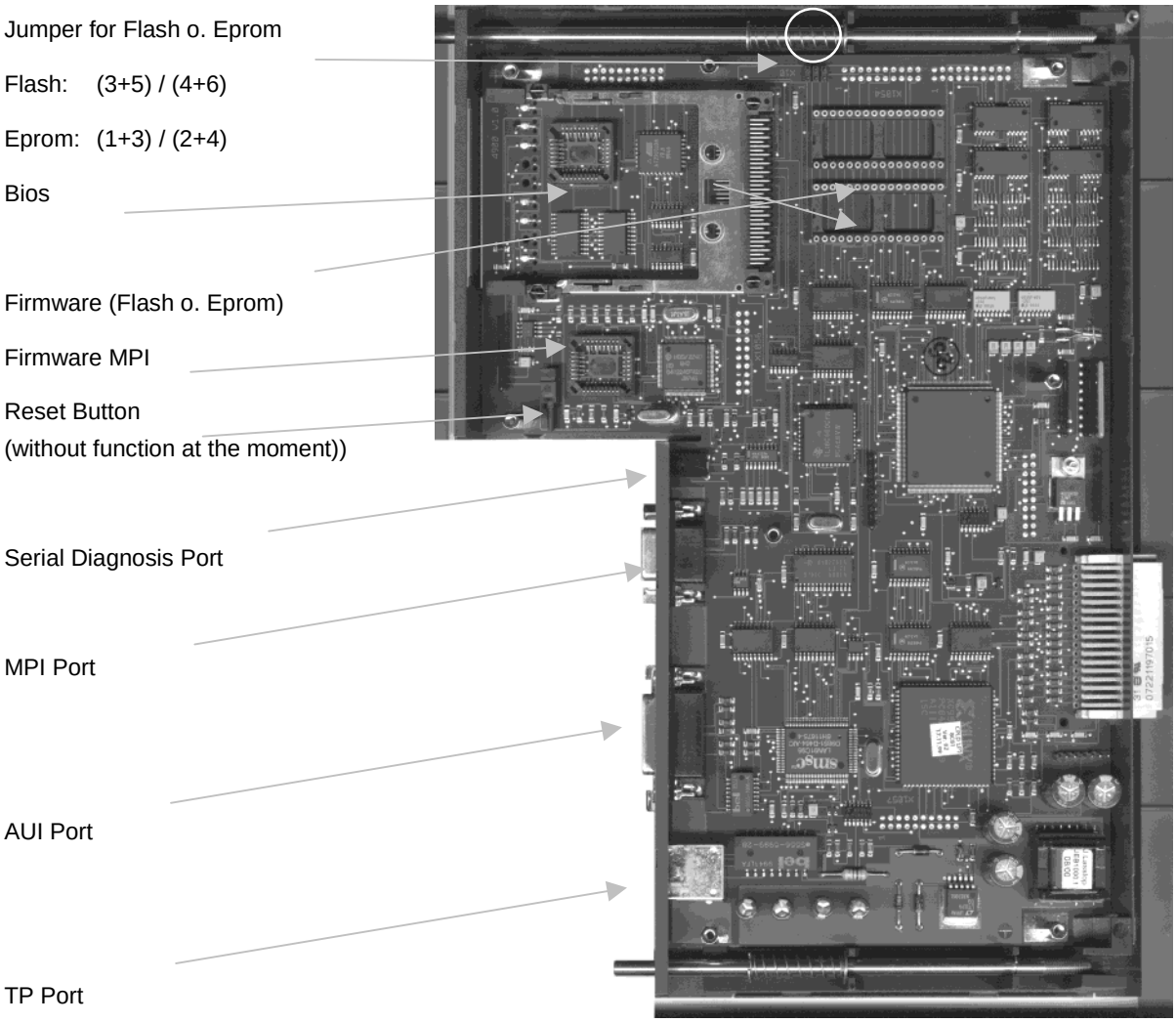


Figure 3-1 Location of the jumpers and interfaces on the S7-TCP/IP board

The INAT NODE and EPROM chips are provided with the Ethernet NODE address or the version number of the used Firmware. You can ask for these version numbers in the delivered parameterization program (version 3.10.4).

0101-001

3.2.1 PCMCIA Slot for Memory Modules

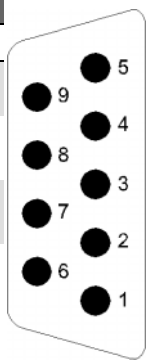
The data permanently stored on the module in the EEPROM module can also be stored on the 64-KB or 256-KB Flash Eprom Card. The memory cards are available under order number 700-7410-64 and 700-7410-256.

Although this upgrade is optional it provides additional backup capacity, ans old modules can be replaced in existing TCP/IP or SINEC H1 networks without losing the system data.

3.2.2 MPI interface

The location of the MPI plug on the INAT S7 TCP/IP module:

Signal	Pin No.
RTS_PG	9
DATA.A	8
+24V	7
+5V	6



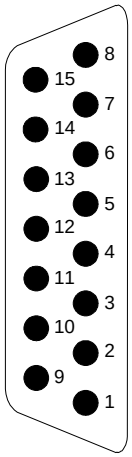
Pin No.	Signal
5	0V (M5V)
4	RTS_AS
3	DATA.B
2	M24V
1	Not used

Figure 3-2 Location of the MPI Interface

3.2.3 AUI Socket

The AUI socket is used for the connection of an Ethernet transceiver.

Signal	Pin No.
-	15
Ground	14
+12V / 500mA / 6W	13
RCV (Receive-)	12
Ground	11
TRMT (Transmit-)	10
CLSN (Collision-)	9

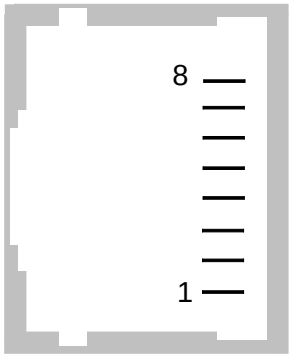


Pin No.	Signal
8	Ground
7	-
6	Ground
5	RCV (Receive+)
4	Ground
3	TRMT (Transmit+)
2	CLSN (Collision+)
1	Ground

Figure 3-3: Plug connector allocation of the AUI interface

3.2.4 TP Socket

If you are using the S7-TCP/IP in a TP network, connect the RJ-45 plug connector to the TP socket .



Pin No.	Allocation
8	Not used
7	Not used
6	RD- (Receive-)
5	Not used
4	Not used
3	RD+ (Receive+)
2	TD- (Transmit-)
1	TD+ (Transmit+)

Figure 3-4: Plug connector allocation of the TP interface

3.2.5 AS/PG cable (PLC cable)

Optional you receive an AG/PG cable (PLC cable; order number: 700-1700-01) to program the AS via bus selection or via network and S7-TCP/IP. The signals path the cable 1:1 because a complete MPI interface is implemented in the module.

3.2.6 Serial Diagnosis Port

Only for internal use!

3.2.7 Reset switch

Actually not supported!

3.3 Using the Module

Installation site
The S7-TCP/IP communications module is installed directly in the central controller or the appropiate expansion device.

Interfaces
The module is equiped with four interfaces:

- Interface to Ethernet TCP/IP or H1 via AUI
- Interface to Ethernet TCP/IP or H1, TP cable (RJ45)
- Interface to the S7 for PG functionality or DIN interface for parameterization

Data exchange/traffic
The S7-TCP/IP communications processor automatically handles data traffic via the TCP/IP and H1 and relieves strain on the S7's CPU. All layers of the ISO-7 layer model are covered.

Data communication between S7-TCP/IP and CPU is organized in standard function blocks (i.e., handling blocks) on the CPU.

Connection Parameters
The connection parmeters and system-related data (e.g., transport connections and links to the S7), are configured with an easy-to-use, menu-controlled parameterization program.
The parameters are stored in the FLASH-ROM of the CP (i.e., no RAM memory module required).

The parameter data stored on the PCMCIA modules can be read and transferred to the FLASH-EPROM. This ensures simple and inexpensive replacement of already existing components by the modules of the S7-TCP/IP family.

The INAT S7-TCP/IP works with TCP/IP connections, H1- connections or a combination of both. The module can also be operated with priorities 0/1 (i.e., datagram, multicast and broadcast), 2/3 and 4.

Special features
The communications processor is delivered with a build-in 15 V power supply for the bus coupler.

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4 Parameterization Software Version 4.0

4.1 Installation and Program Start

A floppy disk for installation is included with the module. The floppy disk contains parameterization programs for the following operating systems:

- Windows NT
- Windows 2000
- Windows 95/98

4.1.1 Installation

Note: Installation of programs and drivers requires the rights of the system administrator.

- Insert the CD-ROM. The installation file is located in the directory: **INAT Projektierung S7-TCP/IP & H1**.
- Start the Paramnt.exe program.
  After preparations for installation have been performed, the starting window of installation appears.
- Select "Continue".
  The copyright sreen appears.
- Select "Continue" again.
  The programs and files are indicated which will now be installed on your system.
- In the next window, you will be asked for the destination directory under which the S7-TCP/IP parameterization is to be installed. **C:\INAT\Projektierung** is suggested as the standard directory.
  If you agree, continue with "Continue" to specify the program group.
  Otherwise, start the file selection box first with "Browse".

  Note: The directories which you specify are set up automatically if they do not exist yet.
- Now specify the program group in which the icons of the S7-TCP/IP parameterization are to be located. The files are then copied.

The final window of the installation tells you that the S7-TCP/IP parameterization has been installed successfully on your hard disk.

Starting the program
There are several ways to start the program. Start the program by double-clicking the "INAT Parameterization" icon. If you want to start the parameterization from the command prompt, switch to the directory in which you have installed this.

Then enter `ParamNT`.

4.2 Starting the Program

- Start your PC and the appropiate operating system.
- Click the "INAT Projektierung" icon. The program is started and displays the starting dialog window for selection of the type of parameterization:

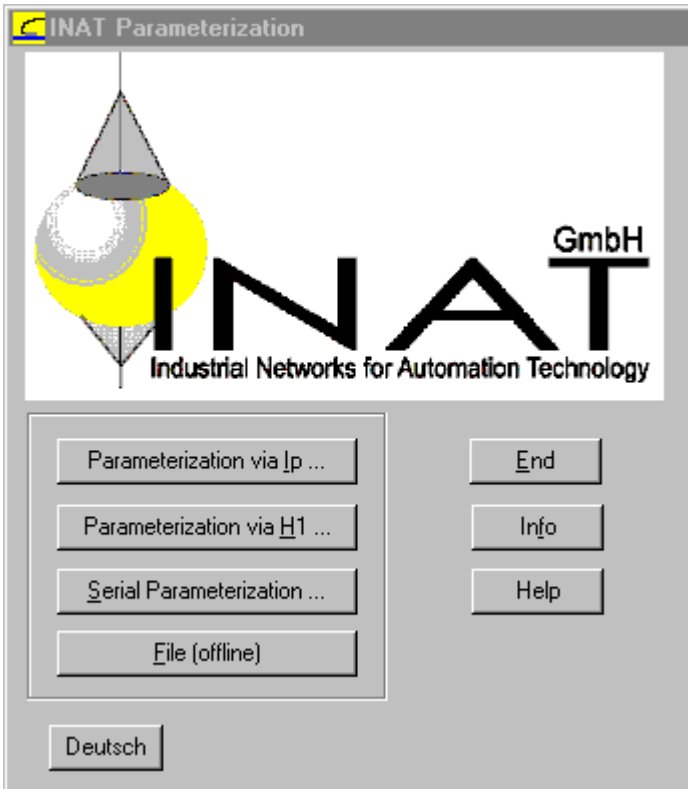

Figure 4-1 Starting dialog window

The starting dialog window offers you four methods of parameterization.

4.2.1 Remote Parameterization

- **Remote parameterization via IP**
  With remote parameterization, the modules are parameterized directly over the **TCP/IP network**. All INAT modules on the network are automatically recognized and indicated online. The indicated modules can then be addressed individually. The modules are selected by IP address (for TCP/IP operation) or by Ethernet address (for H1). The Ethernet address is only assigned once and is linked to the module.

- **Remote parameterization via H1**
  With remote parameterization, the modules are parametrized directly over the **H1 network**. All INAT modules on the network are automaticaly recognized and indicated online. The indicated modules can then be adressed individually. The modules are selected by the Ethernet address. The Ethernet address is only assigned once and is linked to the module.

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4.2.2 Serial Parameterization

This functionality will be supported by the next Firmware-Release.

4.2.3 File (offline)

If you select this option the following dialog window appears:

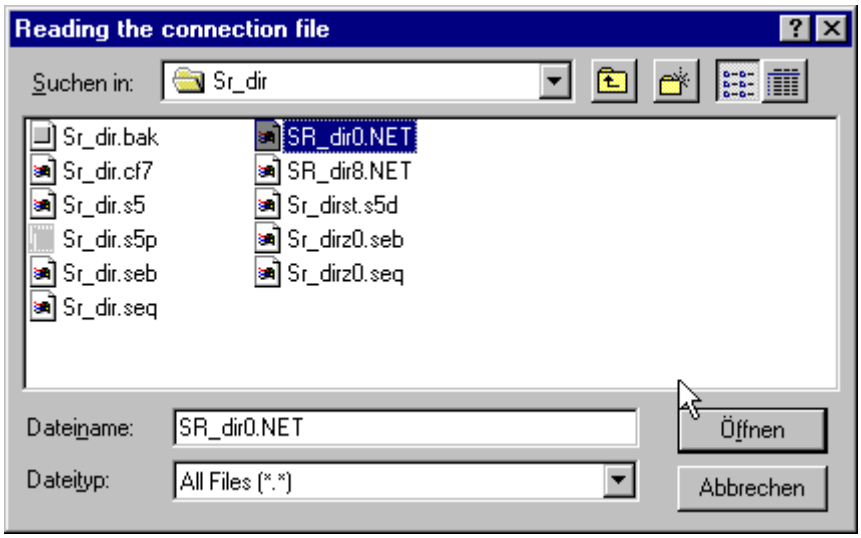

Figure 4-2 Loading the connection file

This window permits another connection file to be set (i.e., offline parameterization).

In the "Look in:" selection box select the drive and the directory in which the connection file to be loaded is located.

The main window shows the connection files located on the current path. Mark the desired connection file, and click "Open".

Brief instruction:

1. In the "Look in:" selection box, select the desired directory.
2. In the file selection box, select the desired connection file.
3. Click "Open."

Create a new .NET file
In this menu it is possible to create a new connection file.

1. In the "File name" selection box: Enter the desired name of the connection file. **Use the extension *.NET**
2. In the file selection box: Select the desired directory, in which the connection file shall be located
3. Click "Open"

Selecting the system

You have selected the offline parameterization. For that reason the automatic online help can´t be active. Please select the system to be parameterized:

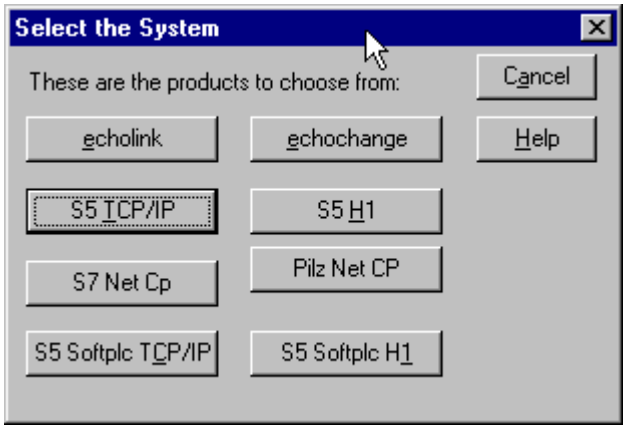

Figure 4-3: Choice of the system to be parameterized

Now, for the parameterization, you get several dialogues that fit the particular system.

4.2.4 Info

The window entitled „Info“ provides you with information on the version, the release number and the manufacturer of the program.

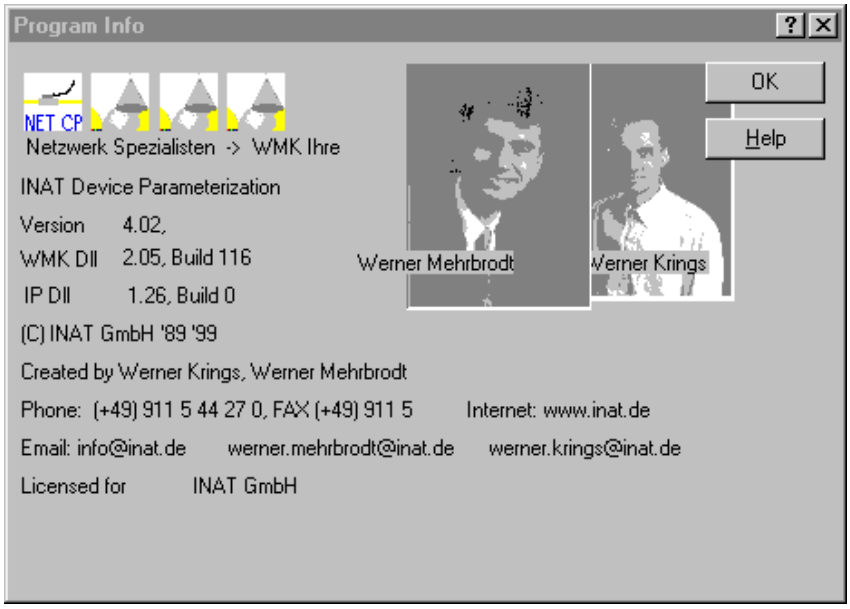

Figure 4-4 Info

The following licence conditions apply to the INAT S7-TCP/IP parameterization software.

- This product may only be used by its final user.

- Distribution of the files (i.e., NET and .INI extensions) prepared with the INAT S5-TCP/IP parameterization software does not require license fees.
- The INAT S7-TCP/IP parameterization software or other files contained on product floppy disks or parts thereof may not be passed on to third parties, lent out or used on several computers at the same time.
- INAT GmbH reserves all further rights, including copies or floppy disks other than those required for personal data backup, and copies of the documentation and further developments. It is the responsibility of th e licensee to store the software so that unauthorized use cannot occur.
- Software and documentation are subject to change without prior notice.
- Program and documentation have been carefully prepared and tested. Except in cases of gross negligence or intent, INAT GmbH accepts no liability for damages caused by the use of the software and documentation. In addition, compatibility of this software with any other programs or hardware components is not guaranteed. Licence conditions also cover any updates or supplements - even without additional notice being given.
- Should one of the proceding points become invalid, the remaining points are not affected.

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4.3 The Station List / Selecting the Station in the Network

When performing parameterization via the network, select the station to be parameterized in the main window.

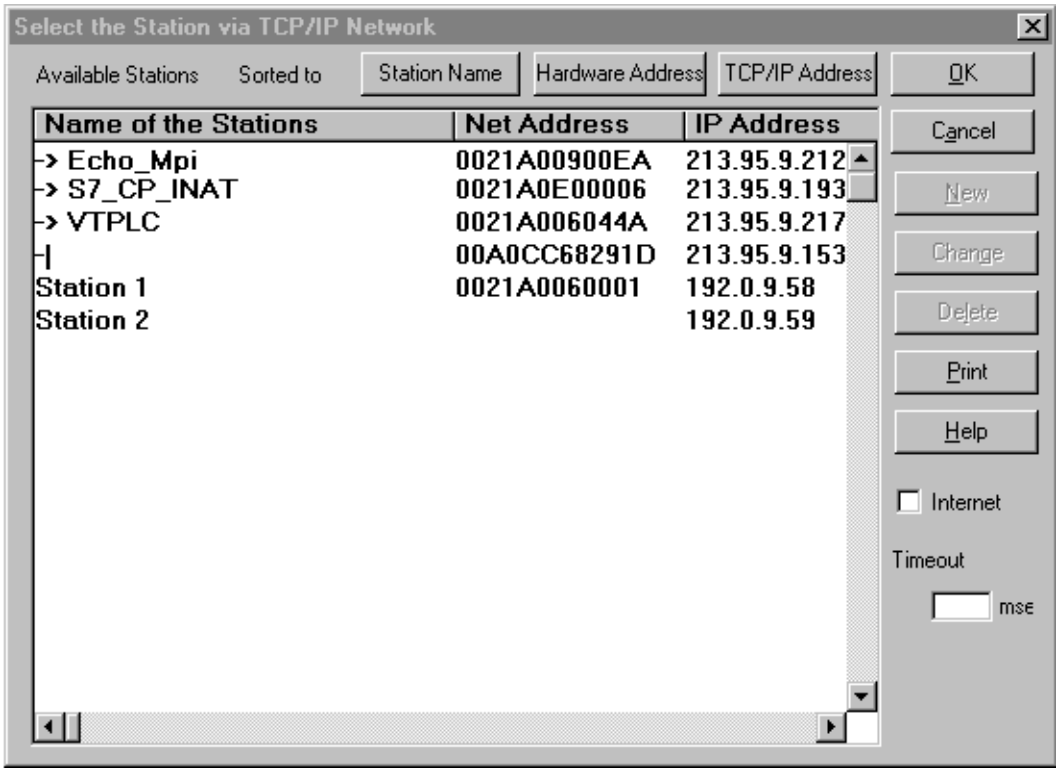

Figure 4-5 Remote parameterization and selection of the station in the network

Symbols of the Station List

OK indicates all available connections for this station. This connection establishment is time-monitored with approx. 5 sec. After this time has expired without a response from the selected station, connection establishment is canceled.

All stations marked with an arrow (→) at the beginning of the line are stations which are currently available online on the network. The other stations may be available but have not been recognized automatically.

All INAT network stations are indicated. Three parameterization procedures can be used by different computers simultaneously with one and the same INAT module.
Remember, however: if two stations have loaded data to the module, it contains the data which were loaded last.

In addition, the ┤ symbol indicates all computers on which the parameterization is running online at the moment.

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Sort function

The names of the stations, indicated in the connection list, you can arrange with the sort function for

- TCP/IP address
- Hardware address (Ethernet) or
- Station name

Parameterization via Internet

With this timeout the default timeout for the parameterization can be changed within one LAN of 2000ms. This is sensible for the parameterization via internet. For this timeout up to 30000ms are possible, according to the internet access.

Please note that the reaction time is high, if there are disturbances of the connection.

4.3.1 New Parameterization Connection

If a station has not been detected in the automatic online display, establish a direct connection to the desired station using "New connection to a station".

Note: Stations located behind routers are not automatically detected!

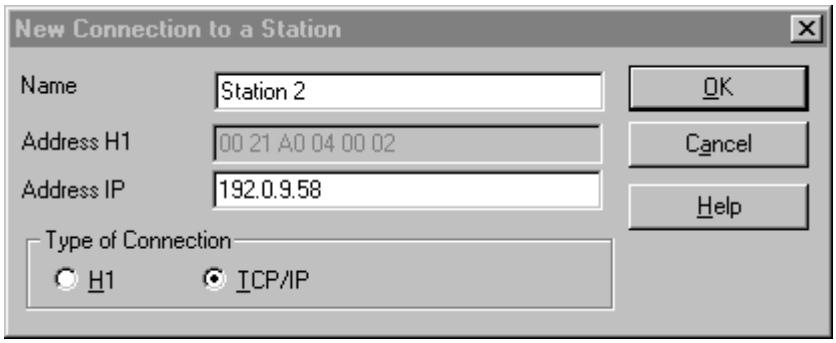

Figure 4-6 Registration of new parameterization connection

The "Name" field contains the symbolic name of the station. The "Address H1" field contains the 6-byte Ethernet address of the station. The "Address IP" field contains the IP address.

Only in this dialog window you can assign new station names.
Both the H1 address and the IP address are available from your system administrator. You can edit stations which are online and offline.

4.3.2 Station Not Found

If a station cannot be found, possible causes are listed below:

Interface via the network

- The selected station is not turned on.
- The protocol (i.e., H1 or TCP/IP) used for the connection to the INAT S7-TCP/IP is not installed correctly on your operator-control computer.
- H1 or IP is not installed correctly on the other network station.

- A station (e.g., router) has disabled the frames for further forwarding.

Serial interface

- The connection cable may not be plugged in.
- The connection cable is allocated incorrectly. The connection to the INAT S7-TCP/IP only uses three lines (i.e., sending data, receiving data and signal ground).
- The interface card on your PC is defective.
- The interface on your PC is being used for another task.

4.3.3 Editing a Parameterization Connection

A newly set up parameterization connection can be modified in this window.

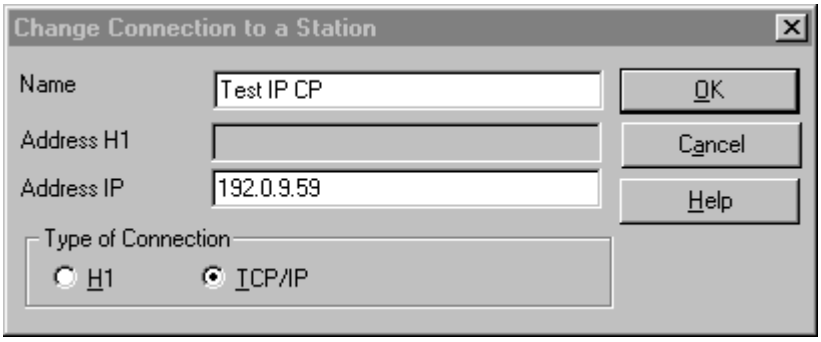

Figure 4-7 Editing the parameterization connection

The "Name" field contains the symbolic name of the station. You cannot edit this name since it is used as a reference. For information on H1 addressing, see chapter 4.5. For composition of the IP address, see chapter 4.6.1.2.

4.3.4 Editing an Online Station

You can use this dialog window to modify the H1 and IP address of stations which are located on the network at the moment.

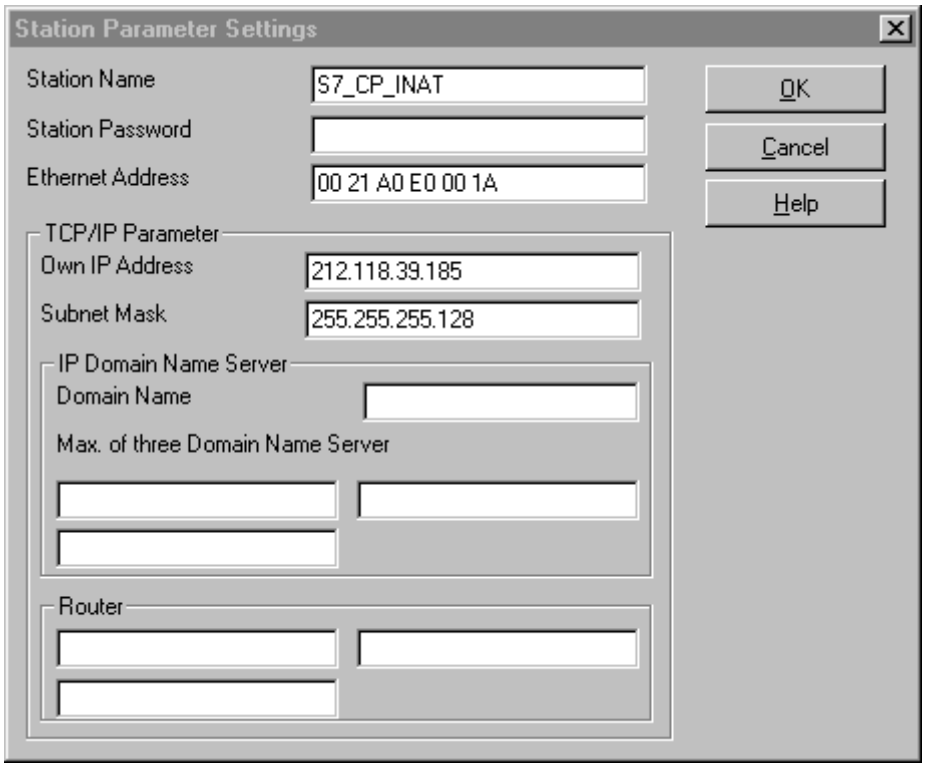

Figure 4-8 Editing a oline station

The "Name" field contains the symbolic name of the station. You can always edit this name. For more details on the dialog window, see chapter 4.7. For information on the H1 address, see chapter 4.5. For the syntax of the IP address, see chapter 4.6.1.2

4.3.5 Deleting a Station

Each time you try to delete a station, a confirmation window appears asking whether you really want to delete this station.

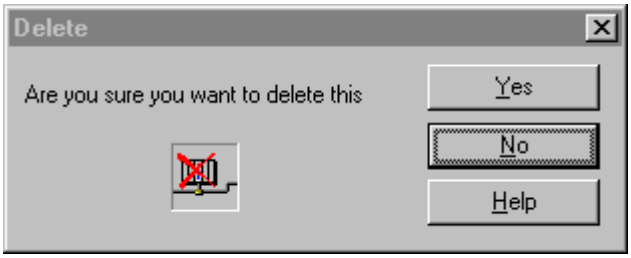

Figure 4-9 Confirmation of deletion

Remember the following if you respond to the request for deletion confirmation with "Yes":

Deletions are irreversible!

4.4 Parameterization

The "Parameterization" dialog window provides you with an overview of the functions for editing individual connections and the connection list. On the left side all INAT stations on network are listet.

The at the moment active station is marked in green.

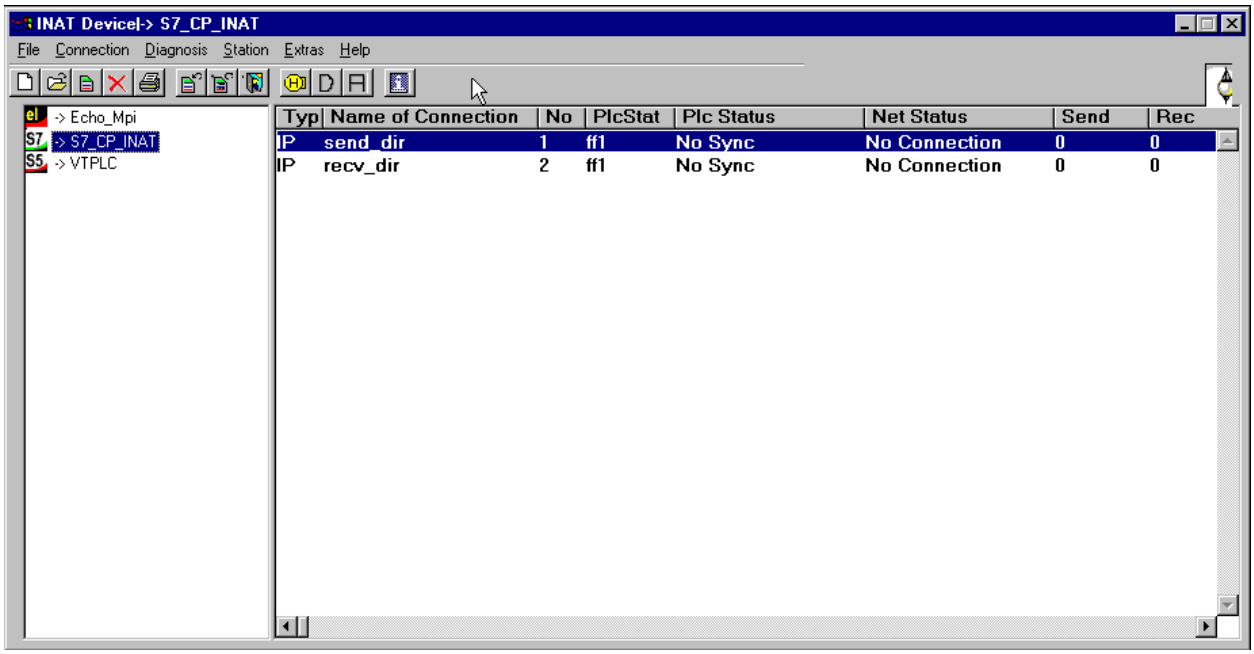

Figure 4-10 Parameterizing the INAT S7-TCP/IP

This window **lists all parameterized connections** of the selected online station with type of connection, connection name, order number (No), Job, type of built connection (Act), destination address (Dest) and parameters. The connections are listed in the order in which they were entered.

Active connections are identified with the corresponding type (IP, H1, FTP, TELNET) at the beginning of the line. Inactive connections don´t have suche an indication.

Using a single mouse click or the cursor keys, you can select a connection and edit it with the appropriate buttons.

By double-clicking a connection, you gain direct access to the dialog window for editing the **parameters of this connection** (IP, H1 and FTP parameters) (see chapter 4.5).

If a connection is marked and you use the right mouse button, several functions appear (network parameters, other parameters...)

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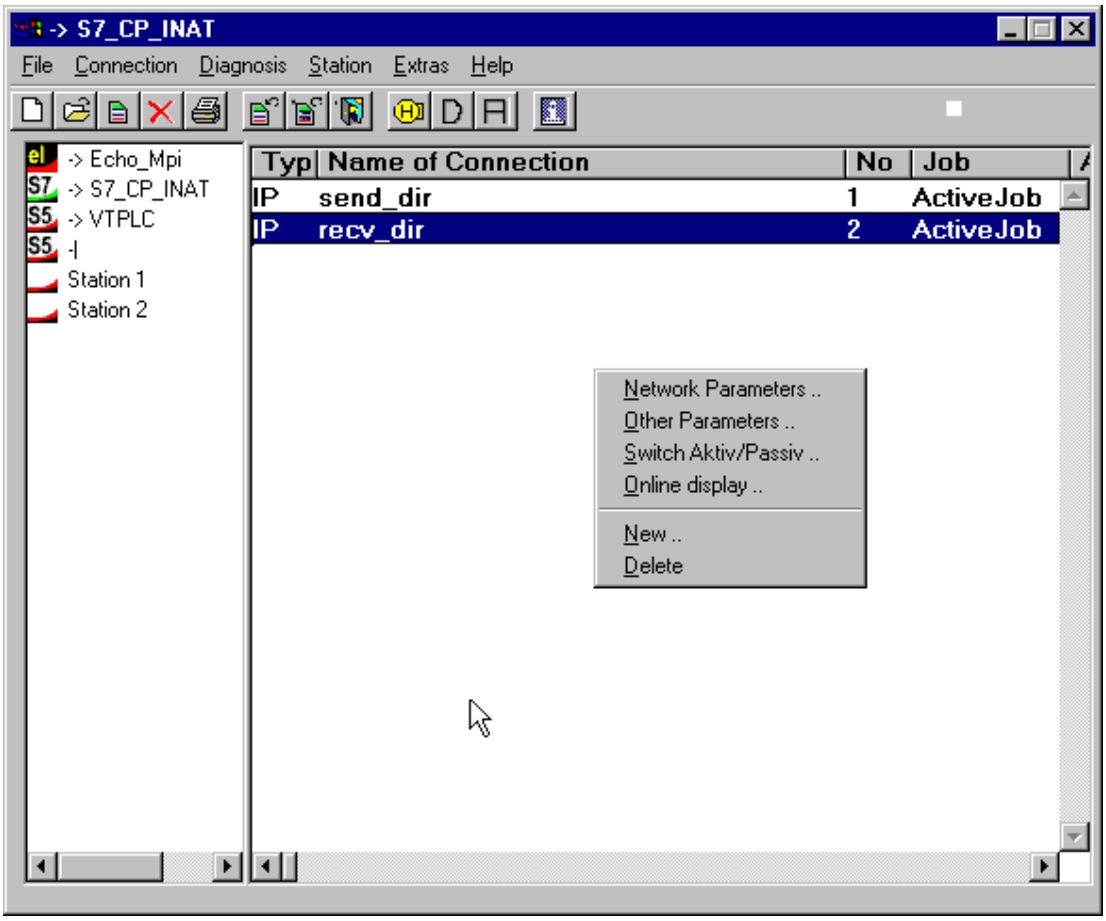

Figure 4-11: Functions

4.5 Menu File (Parameter handling)

4.5.1 Loading the File into the module.

The dialog window entitled "Setting the connection file“ permits another connection file to be set.

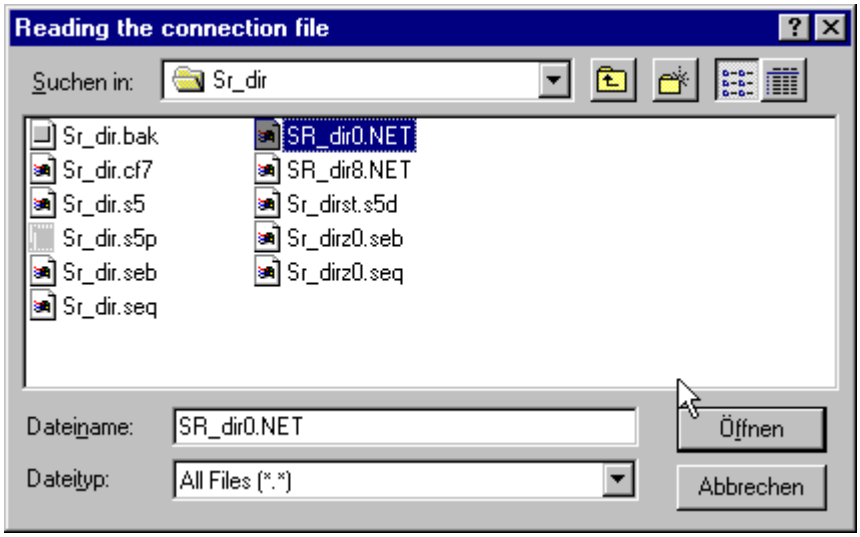

Figure 4-12 Loading the connection file

In the "Look in:" selection box, select the drive and the directory in which the connection file to be loaded is located.

The main window shows the connection files located on the current path. Mark the desired connection file, and click "Open".

Brief instruction:

1. In the "Look in:" selection box select the desired directory.
2. In the file selection box select the desired connection file.
3. Click "Open."

Before the INAT S7-TCP/IP is loaded, you will be asked whether you really want this to be done.

When new connection parameters are loaded to the module, all previously existing connections are stopped and deleted; the new connections are then loaded. The station address and the page frame base address are also loaded again. After all data have been loaded, the module is reset and started again automatically.

4.5.2 Save the Data in a File

After a safety query, the connections on the S7-TCP/IP are transferred to the connection file.

4.5.3 Printing the Connection list

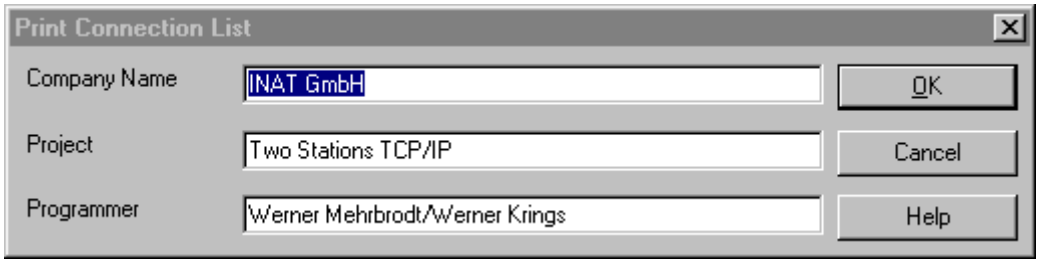

Figure 4-13 Printing the connection list

A list of the connections can be printed for documentation purposes. The entry fields „Company Name“, „Project“ and „Programmers“ should be completed so that the printout can be identified. The printout is made on the standard printer specified for the system. If you would like a printout in a file, set the system standard printer to „Print to file“.

4.5.4 End

Selecting "End", the "Start dialog window" of the Parameterization will appear on the screen.

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4.6 Menu Connection

4.6.1 Network Parameters

4.6.1.1 Editing H1 Parameters

This window provides all functions for editing connections at the H1 level. After you have entered all parameters, click "OK". In offline operation, all changes are stored in the current file. In online operation, the modified parameters are transferred to the module via the serial interface or the network.

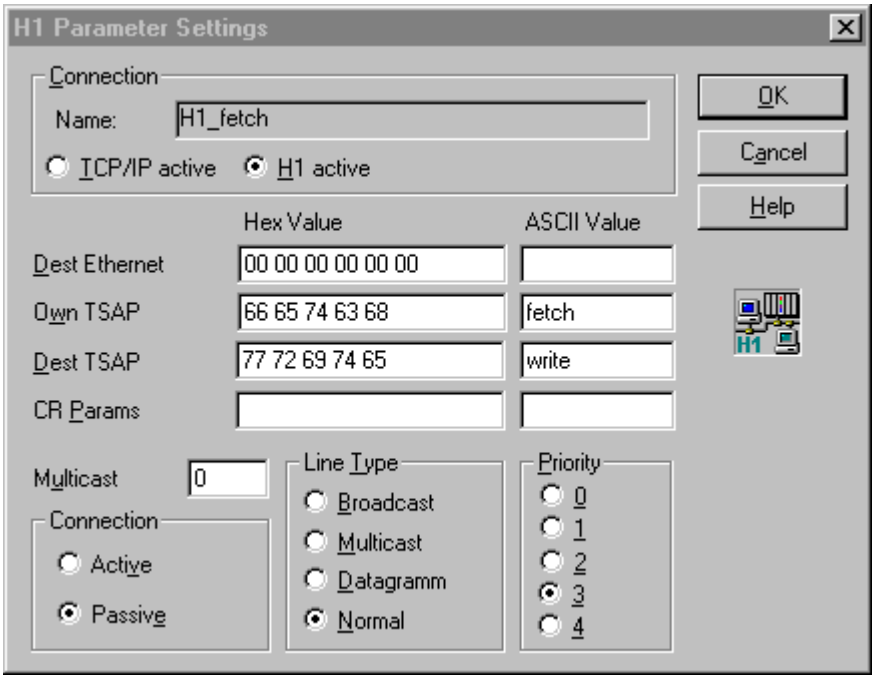

Figure 4-14 Editing H1 parameters

Ethernet H1 connections have many parameters to which certain rules apply. At plants, these Ethernet parameters are usually specified centrally by the network manager.

Experimenting with your own Ethernet parameters can affect the stability of the entire network !

"Connection name"
Here you can give the connection a name. This makes trouble-shooting and diagnosis easier.

"TCP/IP active / H1 active"
Indicates which of the two protocols is activated at the moment. H1 parameterization can only be performed if an H1 connection was also selected in the connection list.

"Destination Ethernet Adresse"
Ethernet address parameters are binary. They can assume all byte states from hex 0 to hex FF. The partner station (e.g., a PLC) is determined with the address. Such an Ethernet address is always 6 characters in length. The first three characters are specified by the manufacturer of the target system. These bytes are assigned centrally by the IEEE Committee. If no such manufacturer's code is assigned, make sure that the first byte is an even number (i.e., it should be divisible by two without remainder). The last three bytes can be assigned as desired. A network may not contain several stations with the same Ethernet address.

"Own TSAP"
The own TSAP (i.e., Transport Service Access Point) specifies the connection address in the own system via which the data are to be communicated.

"Dest TSAP"
The partner TSAP determines the connection address of the other system. When establishing the connection, remember that the own TSAP must correspond to the partner TSAP of the other system. This requirement is easy to adhere to if own and partner TSAP have the same values. The length of a TSAP is often 8 bytes, but it can also vary from 1 to 16 bytes. SINEC systems use the value 20 for the first 3 bytes.

"CR Parameters"
The CR parameters specify the operating mode of the destination system. The contents of these parameters are not specified anywhere. They depend on the destination system. Some H1 interface converters use these parameters to specify the parameters of the second (i.e., serial) interface. Check the user's guide of the destination system to determine what, if anything, must be entered here. If no information is available, no CR parameters should be entered.

Connection active/passive
"Active / passive" specifies whether the own station will actively establish the connection or whether it will wait for the partner station to do the job. The same value may not be entered on both sides of the connection.

"Multicast"
Multicast connections are connections which are not directed to all stations and which only address the stations which have the same Multicast circle number. The number is between 0 and 63. If Multicast is not selected as the „Line type", the value for Multicast circle can be disregarded.

"Line type"
The "**Line type"** specifies whether the frames of this connection will be sent to all stations (i.e., **Broadcast**), whether a certain group of stations is to be reached (i.e., **Multicast**), whether secure connection is to be used (i.e., **Normal**), or whether the data are to be transferred without protection (i.e., **Datagram**).

"Priority"
The line priority can vary from 0 (i.e., highest priority) to 4 (i.e., lowest priority).
0 and 1 are the so-called express priorities while **2 and 3** are the normal priorities. **Priority 4** is

only used infrequently since a new connection must be established for each sending job. If used infrequently, this priority does not place as much of a strain on the network as other priorities since the line is not monitored (i.e., the connection is disconnected after each sending job). Remember that the express priorities do not make transmission faster than the normal priorities. On some controllers, however, the data are transferred to working storage via interrupt when **priority 0** is used. This can make the total data transmission faster. A data length of up to 16 bytes is permitted for **priorities 0 and 1**.

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4.6.1.2 Editing TCP/IP Parameters

A TCP/IP connection requires the specification of the IP address of the destination station. This address is a 32-bit number which is specified in four groups of numbers. Enter a port number (i.e., channel number) for the partner station.

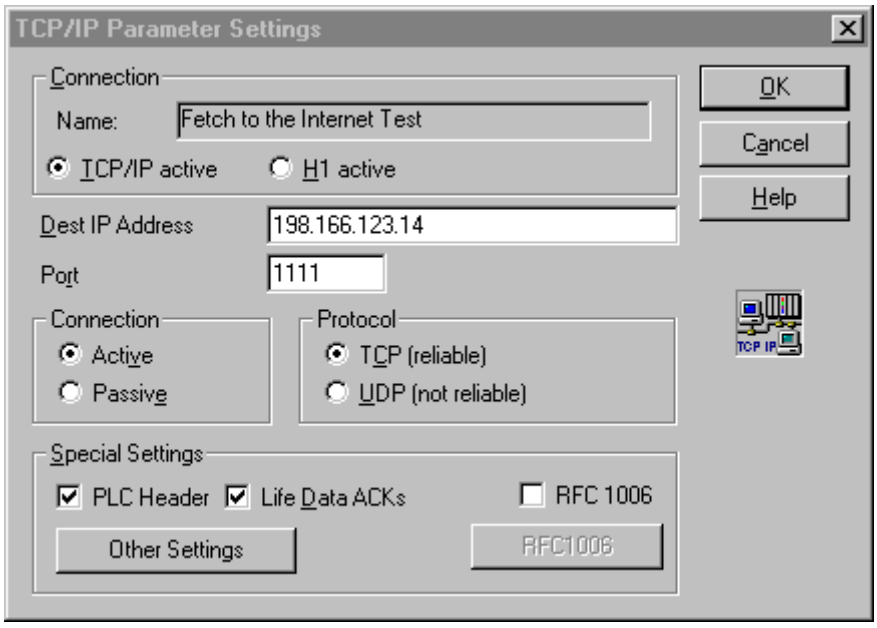

Figure 4-15 Editing TCP/IP parameters

"Dest IP Adresse"
Every computer is addressed by a unique destination address (i.e, IP address). The IP address is a 32-bit number, specified in four groups of numbers. Each number may be from 0 to 255. The grupos are seperated by a dot. If you want to use conventional names for the TCP/IP addresses instead of numbers, you must specify the address of at least one domain name server (i.e., DNS). This server converts all symbolic TCP/IP addresses to numbers.

"Port"
The **port number** is a 16-bit address from 0 to 65535. It specifies the channel via which the applicable connection is to be established. It is a parallel to the TSAP for H1 connections. Port numbers 0 to 255 should not be used since these are already being used by the so-called well-known ports. If own and partner port numbers differ, remember that the partner port number on the partner system is the own port number.

"TCP/UDP Protocol"
Das **TCP** (Transmission Control Protocol) ist ein gesichertes Protokoll mit Checksumme und Bestätigung. **UDP** (User Datagramm Protocol) is not protected. It is handled by datagram services. We recommend selecting the TCP protocol.

Connection establishment active / passive
Select the type of connection establishment (i.e., which station is to initiate connection establishment). If a link to a host has been parameterized, the S7-TCP/IP is usually parameterized as **passive** and the host as **active**. At regular intervals, the active station attempts to set up the appropriate connection.

Special settings

SPS-Header
The data stream-oriented TCP/IP protocol can combine several short data units into longer units. SPS data will be transfered in blocks. For the data transmission to the S7-TCP/IP a special SPS-Header has been created. This SPS-Header prepares the telegrams of the TCP/IP data stream for the use in the SPS. The default setting of the SPS-Header is „activated“. You find the technical data of the header in chapter 6.1.

By selecting **"Activate Life acknowledges / Life data acknowledges"**, the connection monitoring function which is restricted in many socket libraries is activated. The Life Data ACKs are bound to the SPS Header, that means, the SPS Header has to be active. Interrupts can be recognized very fast with this function. If the connection is being handled by the internet (WAN), we recommend deactivating these functions to save costs.

RFC 1006
With the activation of RFC1006 the H1 frames, which have to be transmitted, are implemented in a TCP/IP-frame. With that special TCP/IP channel you are able to communicate with the Siemens CPs of the S5 and S7 series.

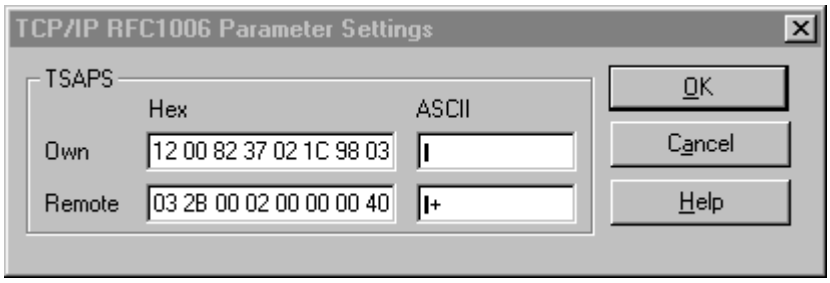

Figure 4-16: RFC1006 Connection parameters

There are special rules for the ISO parameters „Own TSAP“ and „Partner TSAP:

- The entries in the TSAPs have to be two signs length but not more than eight signs.
- You will learn more about TSAPs in chapter “Editing H1 parameters“.

Note: You always have to take „Port 102“ if you want to communicate via RFC 1006!

More settings
More settings means special parameters of a connection. Normally you don´t need them.

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By selecting **"Life acknowledges "**, the connection monitoring function which is restricted in many socket libraries is activated. These frames are used to transfer the connection status to process visualization. We recommend to activate both functions (life acks and data life acks). If the connection is being handled by a WAN, we recommend deactivating these functions to save costs. The default setting of the life acks and data life acks is ”activated”.

No **end check** is useful with Receive Direct connections only. Selecting "No end check" disables the end check of TCP/IP frames with the reading of the data. Rec Direct jobs are finished only without errors if the number of received data is equal to the number you have specified for the job in the PLC. E. g. if a network frame sends more data then you would like to receive with Rec Direct the left over data are delivered to the next Rec Direct. See also "PLC system settings".

The default **connection timout** value of 30 s for parameterization sessions within a LAN can be changed. A change is often useful for parameterization sessions via Internet, for which the monitoring with life acks is disabled. Mind that such a timeout causes higher reaction time for other connection disrupts (i.e. cable damages), too.

With "**change memory in kbytes**" the assignment of memory for the current connection can be changed. The lower limit of memory for a connection is 1460 bytes, which is the ethernet maximum of user data. For broadcast receive connections (UDP) this memory is not sufficient. If the remote station is sending data faster than can received by the PLC, the left over data are buffered in that memory. The UDP data are rejected only, if theis memory is full, too.

Exkurs! Syntax of the TCP/IP addresses

A TCP/IP address is a 32-bit number which is specified in four groups of numbers.
Each number can be from 0 to 255. The groups are separated by a dot.

193.0.9.4 is an example. The following IP addresses are reserved and should not be used:

0.0.0.0
255.255.255.255
127.x.x.x (x = any value)

If you want to use conventional **names** for the TCP/IP addresses instead of numbers, you must specify the address of at least one domain name server (i.e., DNS). This server converts all symbolic TCP/IP addresses to numbers. The address of your DNS server is available from your system administrator or service provider. After a DNS server has been specified and is ready for operation

The address is now www.inat.de instead of 195.180.215.3.

Names are always used in the Internet since names are easier to remember.

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4.6.1.3 Editing the FTP Connection

This function will be supported by one of the next Firmware Rreleases.

4.6.2 SPS Parameters

The S7-TCP/IP supports three types of protocols: S5, S7 and Modbus. When protocol S5 is selected, then it behaves like a S5-TCP/IP and supports the options "CP parameters" and "TF" bellow the normal one.

Select S7 if you want to communicate with stations using exclusively S7 protocol.

If you want to communicate with stations using just Modbus protockol then select "Modbus protocol". In the actual Release this function isn't supported.

4.6.2.1 Editing S7 Parameters

The S7 parameters control the connection between the module and the S7 CPU. Remember that each job number may only be assigned once.

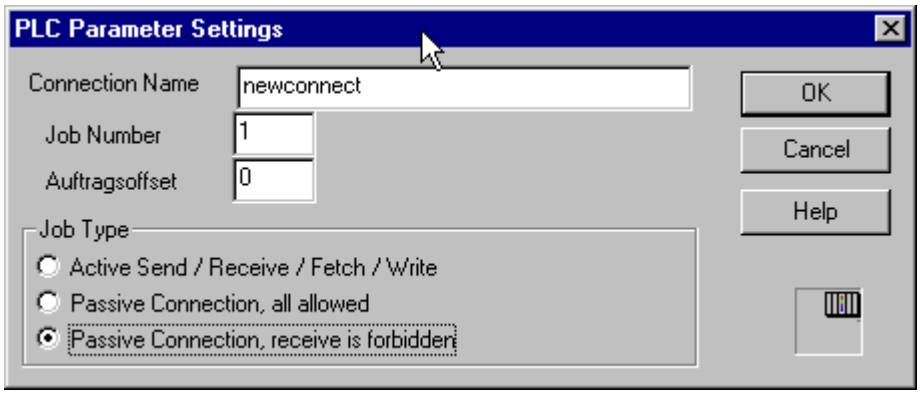

Figure 4-17: Editing the S7 parameters

The following parameters can be entered:

"Conection name"
You have the possibillity to change the name of the new created connection.

"Job number"
Every connection to be used by the communication blocks requires a connection number. This number is then used by the PLC program to address the connection.

"Job offset" (CPU-number)
The CPU number determines the CPU, which is used for the current job. The CPU number is usually used in multiprocessor systems with values greater than zero.

If several CPUs are used, the following applies: CPU 1 is used. Although other configurations are possible, they are not recommended by INAT. The following rule usually applies:

- CPU number 0 for CPU 1
- CPU number 1 for CPU 2

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- CPU number 2 for CPU 3
- CPU number 3 for CPU 4

"Type of job"

The following types of jobs are available:

- "Active Connection Send / Receive / Fetch / Write"
  Send / Receive unstructured data.
- "Read and Write Passive Connection"
  Read and Write Connection to the controller
- "Passive Connection, Read Only "
  Read Connection to the controller (Write is not allowed)

4.6.2.2 PLC Connection Settings

If you check the parameters again (in the overview), mark the desired connection with the cursor or with the mouse. Then click the "PLC connection settings" button.

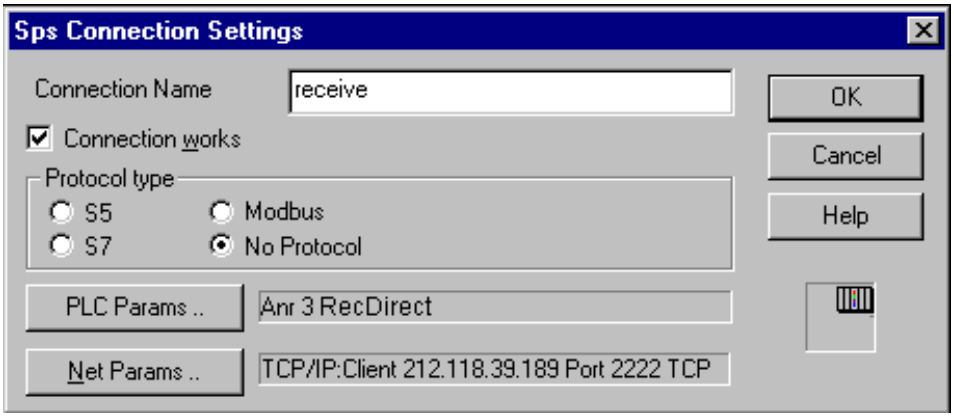

Figure 4-18: PLC Connection Settings

"Connection works"
If you establish a new connection, it is active and works automatically. Connections, which are not being used temporary must not be deleted. They can be set inactive by deselecting the button "Connection works".

"Protocol Type"
Here you have again the possibility to change the protocol type. Don´t forget to change the corresponding PLC parameters, too.

"PLC Parameters"
The actual PLC parameters are listed to the right of this button. If you want to change this parameters click the "PLC Parameters" button.

"Net Parameters"
The actual TCP/IP or H1 parameters are listed to the right of this button. Click the "Net Parameters" button if you want to change this parameters.

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4.6.3 New Connection

The following entries can be made in the dialog box entitled "New Connection":

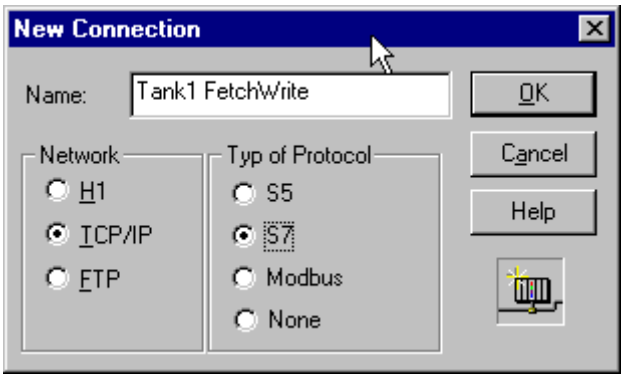

Figure 4-19 New connection

"Name"

All parameterization data are allocated to the connections. Every connection is identified by a connection name. A connection name may contain all characters including blanks. The names may be up to 32 characters in length.

"Network "(Type of Connection)

H1 A connection can be handled with the H1 frame or with the TCP/IP frame. Connections between controllers should be handled via H1. The H1 frames are faster, and less strain is placed on the network.

TCP/IP Connections are primarily used for the link to a host computer (i.e., primarily UNIX systems).

FTP Connections via the File Transfer Protocol. The FTP permits data and programs to be copied and transferred between different systems via the GET and PUT commands.

This functionality will be supported by the next Firmware-Release.

"Type of Protocol"

S5 Select S5 if you want the S7-TCP/IP to behave like the S5-TCP/IP. In addition to the normal type of jobs it supports the options CP Parameters and TF.

S7 Select S7 if you want to communicate with stations using exclusively the S7 protocol.

Modbus

If you want to communicate with stations using exclusively the Modbus protocol then select "Modbus protocol". In the actual Release this function is not being supported.

4.6.4 Connection / Deletion

Connections can not only be switched inactive, they can also be deleted. After clicking the "Delete" button, the following box appears.

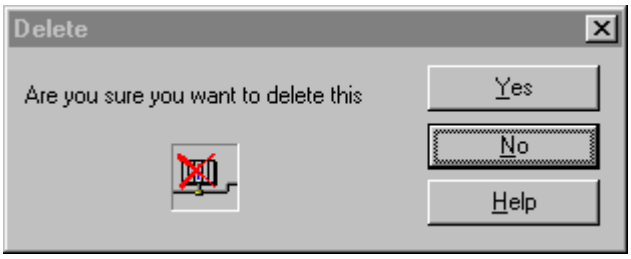

Figure 4-20 Deletion

If you reply to the "are-you-sure" question with "Yes", the selected connection will be deleted permanently.

4.6.5 New Display

This function is primarily designed for the serial link. The connection list can be read again from the INAT module. For example, this becomes necessary when the connection cable is plugged into another INAT CP.

The connection list is set up again with the current connections.

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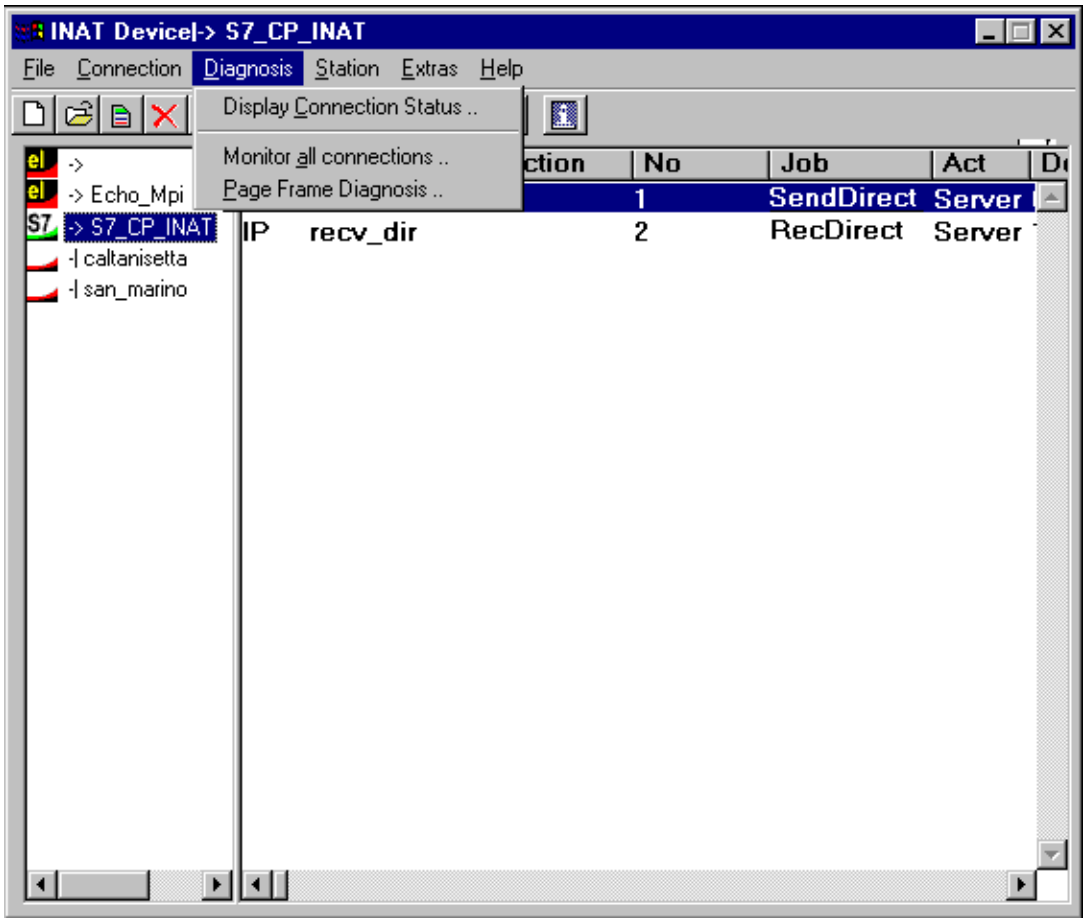
4.7 Menu Diagnosis

The menu "Diagnosis" offers three ways of communications diagnosis.

- Connection status of the actual connection
- Connection status of all connections of the actual station
- Diagnosis of the dual port RAM interface



4.7.1 Online Indication / Connection Status

The status box is used to monitor a connection. The name of the connection is shown in the title.

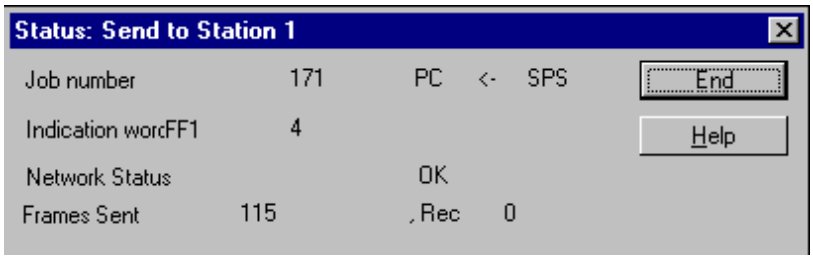


Figure 4-21 Status of a connection

The following values are displayed in this window:

Job Number
Each connection which is to be used by the S7 standard communications blocks requires a job number. The connection is then addressed under this number by the PLC program.

Direction of connection
The direction (i.e., from where to where) is indicated here. Particularly when serial parameterization is being used, transmission errors become obvious when only one sending direction is suddenly indicated.

"Indication word"
The current indication word is shown in addition to the job number. If the connection has not been entered (i.e., "Automatic entry" has not been set), this is indicated in plain text.

"Status"
Since sending and reading can always be performed on one connection, the sending and read portions are monitored separately. The contents of the indication word are indicated in plain text, followed by the **number of frames** since the connection was started.

4.7.2 "Monitor all connections"

The "Monitor All" button is used to open the following window:

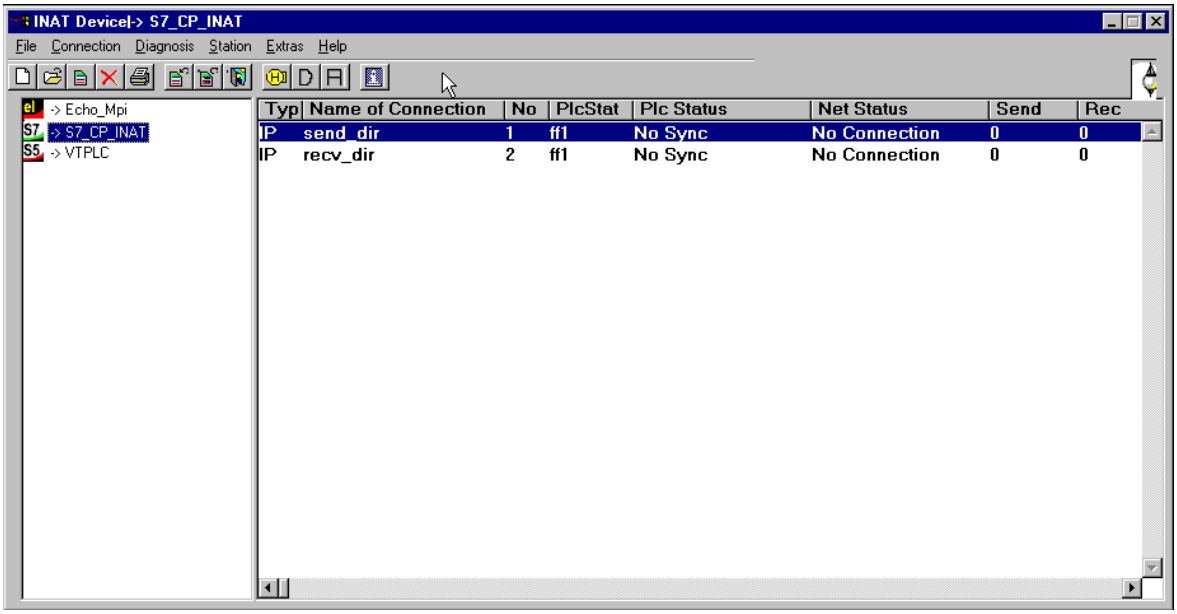


Figure 4-22 Indication words of the connection numbers

This window indicates all connections with their indication words.

"Indication Word"
The current indication word is shown in addition to the job number. If the connection has not been entered (i.e., "Automatic entry" has not been set), this is indicated in plain text.

"Status"
Since sending and reading can always be performed on one connection, the sending and read

portions are monitored separately. The contents of the indication word are indicated in plain text, followed by the **number of frames** since the connection was started.

"SEND / REC"
Is the number of transferred frames since the connection was started.

"PLCStat"
The indication words are evaluated by bit and shown in hexadecimal code. The meaning of the individual bits is explained in chapter 5.2.8 STATUS "Monitor Indication Double Word".

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4.7.3 Page Frame Diagnosis

A window entitled "Expanded Diagnosis" appears.

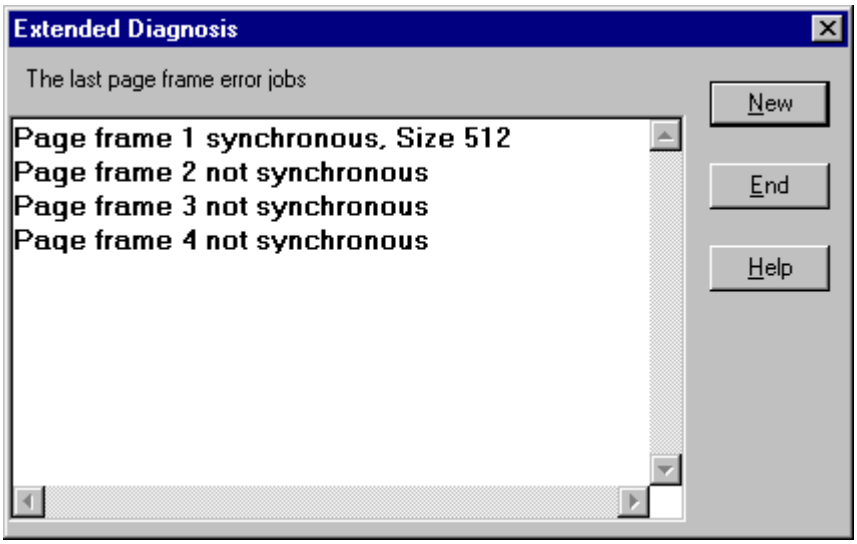

Figure 4-23 Expanded diagnosis

The window entitled "Exapnded Diagnosis" helps you to locate the causes for communication malfunctions. It is shown for all page frames whether they are synchronized. If a page frame is synchronized, its DPRAM size is also shown.

If jobs have been processed incorrectly by the controller, up to ten error jobs are indicated. The following information is given for each error job:

- Job number
- CPU number
- Job identifier
- Block number
- Offset on the block
- Length of the area

By clicking "New", you can view the refreshed values in the indication.

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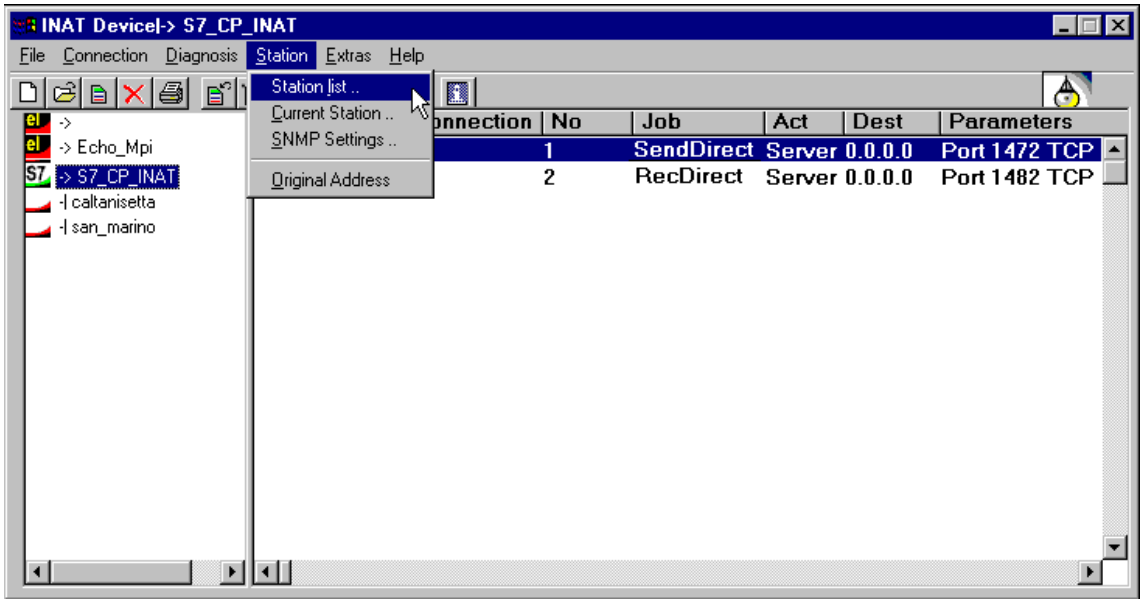
4.8 Menu Station

Here you have the possibility to select one of the following options:



4.8.1 Station List

Pushing the button "Station list" you will return to the online list of all remote stations in the network (see chapter 4.3 for more informations):

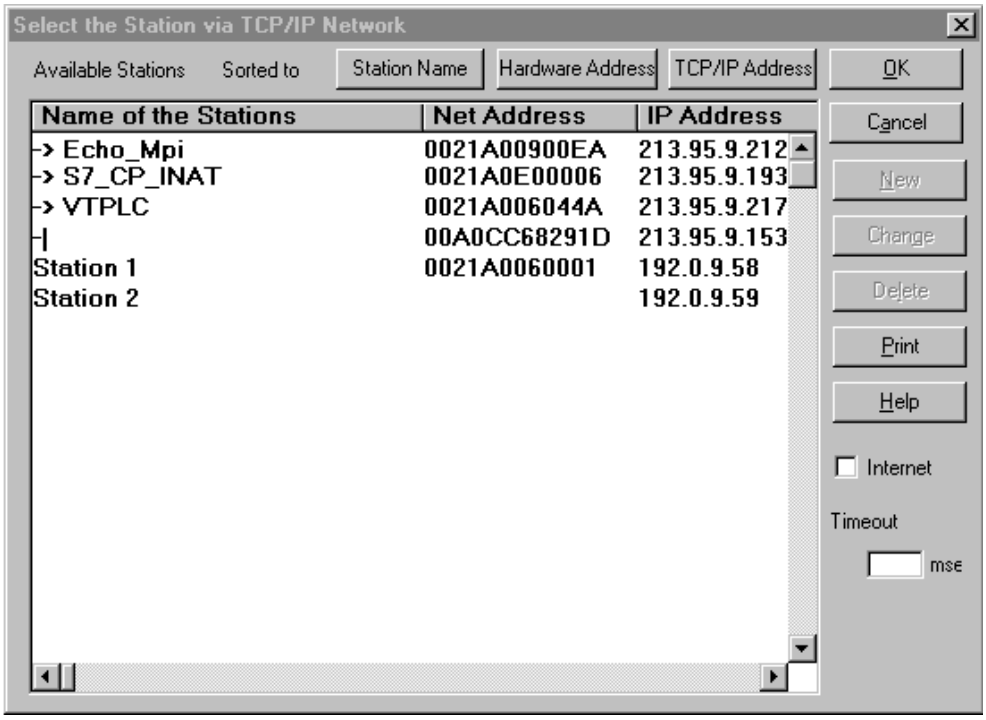


Figure 4-24: Station list

4.8.2 Own Station

This screen is used to edit the own station parameters. The following entries can be made:

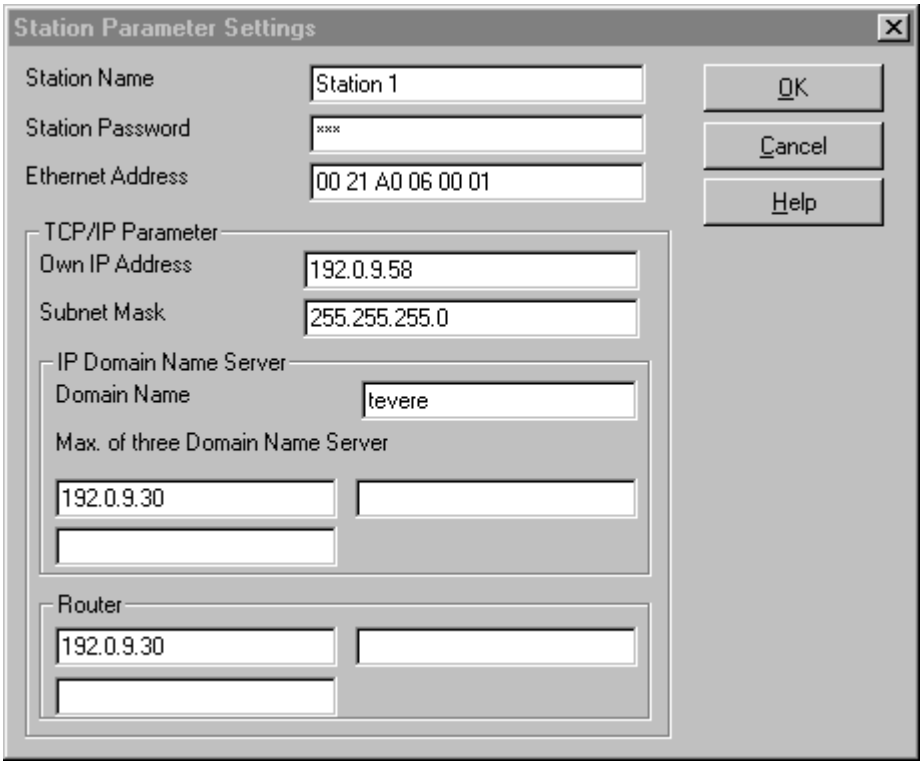


Figure 4-25 Editing the station parameters

"Station Name"
Each station can be assigned a name. This name is used to identify the station.

Note! Remember that each station name within a network must be unambiguous.

"Station Password"
If a password is set, parameterization cannot be performed without the password.

"Ethernet address"
Each station in Ethernet has an unambiguous station address. Since, when H1 is used, the address of the other stations is entered directly on each station, it should be possible to change this address. The own station address may not consist of only zero bytes. Broadcast addresses cannot be used.

Note! The addresses within a network must be unambiguous (i.e., no two addresses may be the same). For the Ethernet NODE address of the S7-TCP/IP, see the INAT NODE CHIP of the module.

To obtain the complete Ethernet address of your module, add the following INAT identifier to the three bytes on the INAT node chip:

INAT identifier: 00 21 A0

The complete station address is: **00 21 A0 XX XX XX.**

"Own IP Address"
Own IP addresses can be assigned within a network. If desired, an address area can be assigned to an installation to ensure that end systems can always be identified unambiguously.

"Subnet Mask"
The value of the Subnet Mask is available from your system administrator.

"IP Domain Name Server"
The IP domain name server converts the symbolic Internet names to station addresses. The address of your domain name server is available from your system administrator. Up to three domain names can be used.

"Domain Name"
The domain name is used to address the servers in the network.

"Router"
A router is used when an address cannot be located on the local network.

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4.8.3 SNMP Settings

The SNMP services (Simple Network Management Protocol) in accordance with RFCs 1441 to 1452 offer systematic management and monitoring of a network.

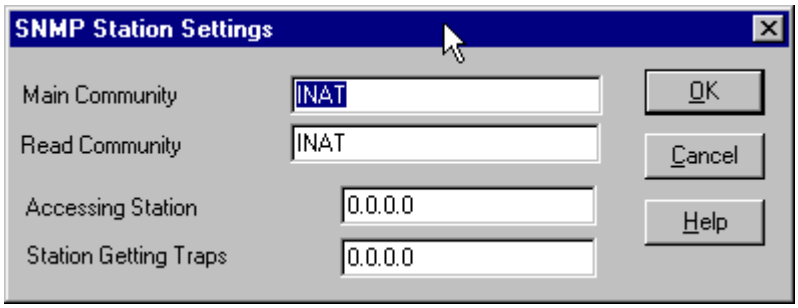

Figure 4-26 SNMP settings

The SNMP services in accordance with MIB II (Management Information Base) are present on the INAT S7-TCP/IP. MIB defines the objects monitored by the SNMP services (e.g., description of the system, IP package statistics, address conversion, network interfaces, and much more). Each important event is defined in an MIB module. When an important event has occurred, a report (the so-called SNMP trap) is sent to all management stations.

The following parameters can be set:

"Main Community" is the identifier with which all services on the INAT S7-TCP/IP can be addressed. If no identifier is entered here, all stations can perform accesses.

"**Read Community"** is the identifier for read-only accesses. If no identifier is entered here, all stations can perform read-accesses. Write-accesses are not permitted with this identifier. The main community is used for this.

"**Accessing station"** can be further restricted in addition to the identifiers. If an address other than 0 is entered here, write-accesses can only be performed by the station specified here.

Traps are sent to the station entered in **"Station which is getting traps"**. If no station is entered here (i.e., value is 0), no traps are generated.

SNMP services are addressed via port 161. Traps are sent on port 162.

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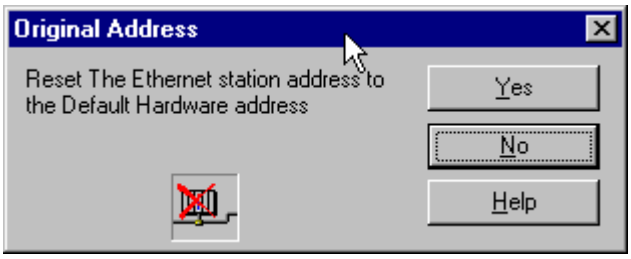
4.8.4 Original address

This function resets the station address to ist status on delivery.



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4.9 Menu Extras

4.9.1 Parameter → Flash Card

In addition to the possibility of storing the system data on EEPROM (onboard resident), the S7-TCP/IP with its slot for a memory card provides additional backup capacity.

The function "Copy Parameters in ROM“ copies the parameters of the INAT S7-TCP/IP to the ROM module in the module slot. An INAT memory card (128-KB, short model) must be inserted in the module slot. The parameters of the memory card are overwritten. After the programming procedure, the module contains all parameters required by an INAT S7-TCP/IP. This additional backup capacity permits easy replacement of old modules without losing system data.

Before transferring the parameters from the memory card to intern resident memory of the S7 TCP/IP, you should notice the following:

1. Install the memory card into the module rack of the module.
2. Connect the module to the S7 control.
3. Turn the power supply on

Note: Before loading the INAT S7-TCP/IP you will be asked if you really want this to be done.

4.9.2 IP System Values

The TCP/IP system parameters represent the operating parameters in the TCP/IP kernel. The values should only be changed in special cases. If it is necessary to change the values, please ask your system administrator.

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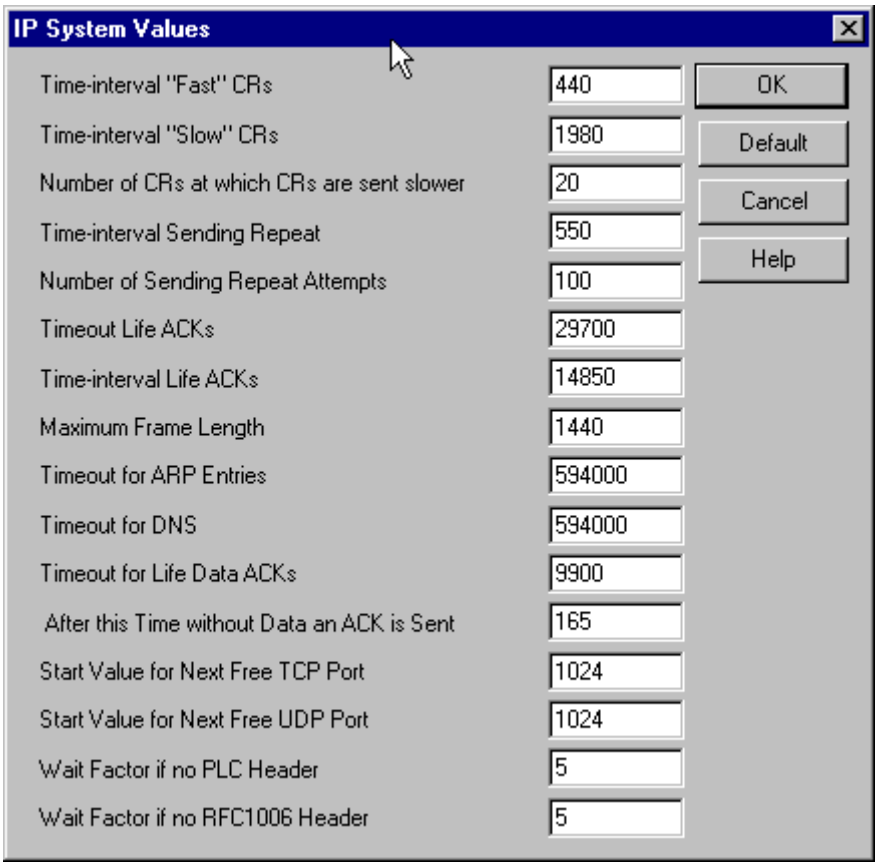

Figure 4-27 IP System values

Time-interval "Fast" CR [ms]
is the time from one ConnectRequest attempt until the next attempt (if the connection cannot be established) before which the maximum number of CRs is exceeded and sending becomes slower.

Time-interval "Slow" CR [ms]
is the time from one ConnectRequest attempt until the next attempt (if the connection cannot be established) before which the maximum number of CRs is exceeded and sending becomes slower.

Number of the CRs at which CRs are sent slower [Integer]
specifies the number of unsuccessful ConnectRequest attempts after which attempts are no longer performed as frequently. This reduces the network load created by unsuccessful connection attempts. Despite this, after each connection establishment and disconnection, a quick attempt is made to reestablish the connection.

Time-interval Sending Repeat [ms]
repeats a telegram when no acknowledgment arrives within this time confirming that the partner station has received the data.

"Number of Sending Repeat Attempts [ms]
determines the number of attempts after which the connection is considered faulty.

Timeout Life ACKs [ms]
specifies the time after which an acknowledgment is to be sent when no data communication takes place. This value can be zero for the TCP/IP. If so, this disables the life telegrams. If "Activate Life Telegrams/Data Life Telegrams" is selected, this activates the connection

monitoring function which is restricted in many socket libraries. These telegrams are used to transfer the connection status.

Time-interval Life ACKs [ms]
specifies the time after which an acknowledgment is to be sent when no data communication takes place. This value can be zero for the TCP/IP. If so, this disables the life telegrams. If "Activate Life Telegrams/Data Life Telegrams" is selected, this activates the connection monitoring function which is restricted in many socket libraries. These telegrams are used to transfer the connection status.

Maximum Frame Length [Bytes]
is the maximum number of bytes which are transferred in a telegram.

Timeout for ARP Entries [ms]
determines the time after which an entry in the ARP cache (Address Resolution Protocol) becomes invalid. Each access to a certain address on the cache sets the value again.

Timeout for DNS [ms]
determines the time after which a name could not be converted into an IP address.

Timeout for Life Data ACKs [ms]
Time without data communication after which the connection is considered interrupted. Since the TCP/IP usually does not use life telegrams as long-distance telegrams, the connection is also interrupted when no data have been transferred during the specified time.

After this Time without Data an ACK is Sent [ms]
After 60 Acks the Timeout for Life Data Acks is dropped and the connection is is considered interrupted.

Start Value for the Next Free TCP Port [Integer]
is used for TCP connections for which both ports are not specified. If a port is parameterized as 0, a port number is generated. The numbers which are used start at the value given here.

Start Value for the Next Free UDP Port [Integer]
is the same for UDP connections.

Wait Factor if no SPS Header [Integer]
Wait Factor if no RFC 1006 Header

If the header is eliminated, the integrated connection control will be also finished. Therefore if you use long-distance telegrams, it is recommanded to increase the timeout for Life ACKs. The standard is 5 (29700ms x 5 = 2,5 [min]).

If it is necessary to change the default settings, please contact the INAT Support.

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4.9.3 H1 System Values

The H1 system parameters represent the operating parameters of layer 4. The values should only be changed in special cases.

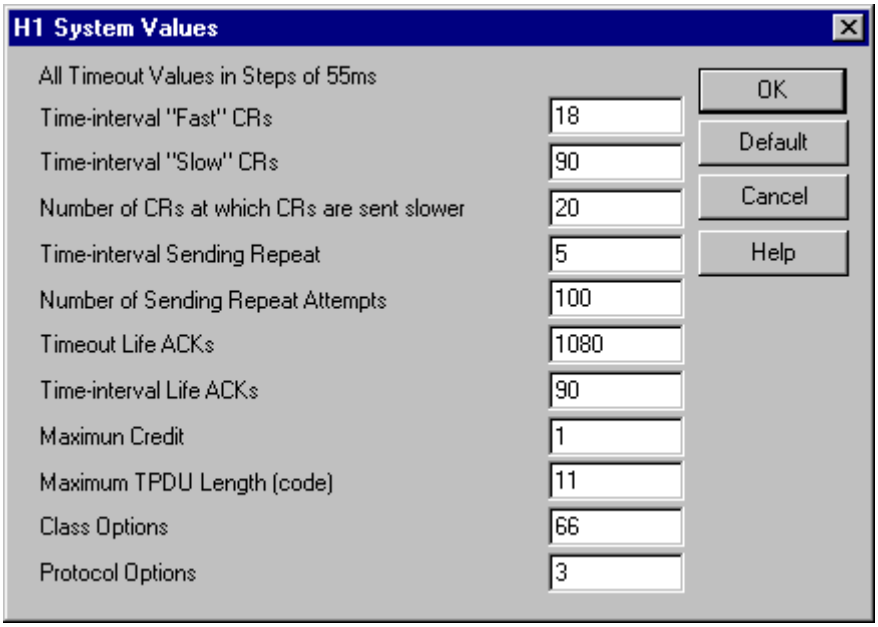

Figure 4-28 H1 System values

Time-interval "Fast" CR [1/18 s]
This value specifies the time interval between two ConnectRequest attempts (if the connection cannot be established) before which the maximum number of CRs is exceeded and sending becomes slower.

Time-interval "Slow“ CR [1/18 s]
Enter the time interval between two ConnectRequest attempts (if the connection cannot be established) after which the maximum number of CRs is exceeded and sending becomes slower.

Number of CR at ehich CRs are sent slower [Integer]
This value specifies the number of unsuccessful ConnectRequest attempts after which the attempts are performed less frequently. This reduces the network load caused by unsuccessful attempts to establish connections. After each connection establishment and disconnection, the system attempts to reestablish the connection.

Time-interval Sending [1/18 s]
Time interval between the first and second attempt to send.

Number of Sending Repeat [Integer]
The number of repeated attempts to send data with the same sequence number.

Timeout Lebenstelegramme [1/18 s]
Time without data communication after which the connection is considered interrupted.

Time-interval Life ACKs [1/18 s]
Specifies the time after which an acknowledgment is to be sent when no data communication takes place.

Maximum Credit [HEX]
It is the maximum value for the credit. Credit is the number of TPDUs(Transport Data Control Unit) which may be sent without ACKs by the sending station from the destination station.

Maximum TPDU Length [HEX]
Maximal value of data length in H1.

Class Options [HEX]
Som of the services offered by the H1 classes 0 to 4 may be activated within the "Class Options".

Protocoll Options [HEX]
By the HEX value 3 you may activate the Checksum and the Expediated Data Transfer.

If it is necessary to change the default settings, please contact the INAT Support.

4.9.4 Delete connections

This function resets the module to ist status on delivery. Remeber that all connection parameters must then be set again. The station paramters are not deleted.

4.9.5 PLC System Settings

These values influence the behaviour of the S7 TCP/IP-H1 to the control.

"Do Direct Jobs Always with All"
Some older PLC programs require the setting "Do Direct Jobs Always with All". If this mode is active the data communication is slower and the cycle time load of the CPU is greater.

If this mode is not active the data from the PLC are accepted immediately while in "Do Direct..." mode the data are not accepted until the next Send/RecAll call.

Note
In the window "Editing S5 parameters" this function refers to the current connection.

In the actual window "PLC System Settings" this function can be set global for all connections of the corresponding station.

"Sync Resets all Connections "
stops all connections and restarts them if the PLC is switched from STOP into RUN. All data in the receiving buffer are deleted. This is necessary for Fetch- and Write connections because otherwise the internal status of the data transfer between both stations is no longer defined.

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If this mode is not active the connections are preserved when a restart is made. For running Fetch- or Write-jobs this can force inconsistent states because the stopped PLC doesn't manage data transfer via the internal rack communication.

If this mode is active each Fetch, Write, Fetch Passive/Write Passive connection has to be reset when the PLC is switched to RUN. Send Direct and Receive Direct connections are not influenced by this mode. Data are not being lost by switching from STOP to RUN.

"Receive Direct is Finished if Buffer is Full"
is active the Rec Direct jobs are finished only without errors if the number of received data is equal to the number you have specified for the job in the PLC. All end checks of the network protocols are ignored. E. g. if a network frame sends more data then you would like to receive with Rec Direct the left over data are delivered to the next Rec Direct. This can be useful for some TCP/IP stations if they don't handle correctly with the end check.

All visualization PCs handle the TCP/IP correctly, always.

PG Reset

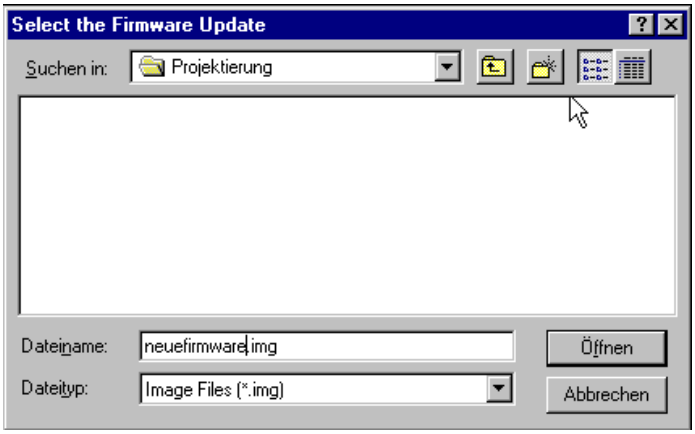
the button "PG Reset" enables you to reinitialize the PG interface without a reboot of the connected PLC. That reset button enables you to shorten the several minute timeout interval after serial PG accesses.

4.9.6 Modbus Table

This functionality will be supported by one of the next Firmware-Releases.

4.9.7 Firmware Update

For updates of the S7-TCP/IP card, you receive an Image File via email or on a floppy disc. Open this file in the following dialog window:



1) The Image File will be loaded to the S7-TCP/IP. It takes approx. 20s. Then observe the LEDs:

   After approx. 5 s the LEDs begin to blink. The Flash Copy is running.

Note

- Don´t turn off the PLC during this minute. Otherwise it doesn´t boot anymore and has to be sent in
- Sometimes the Flash programming stops for 2 s. Not until all 4 green LEDs are silent for some seconds, the programming is completed.
- During the Flach Copy you can´t access to the CP with the parameterization
- During this time (Upload and Flash programming), PLC connections should not work

2) The transmission in the CP is completed if the LEDs are silent.
3) Turn the PLC off and then on again.
4) The new Firmware is working.

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4.10 Menu Help

4.10.1 Working with Online Help

No matter where you are in the program, you can request help with the <F1> key. In addition, there are help buttons located at many points throughout the program. Click these buttons with the left mouse button to obtain help texts on the particular function.

If you would like to learn about the help function, press the <F1> key while the help window is open.

Within the help texts you will find underlined green text positions providing cross references to related or higher level/lower level topics. One of these cross references can be selected with the <Tab> key. To branch to the applicable help topic, press the Enter key.

If you are using a mouse, you can also make this branch by double-clicking the cross reference with the left mouse button.

The following buttons are used to manipulate the help dialog window.

"Previous topic"
This function indicates the previous topic.

"Search"
You will be asked to enter a search topic in the dialog window.

"Print"
"Print" opens a dialog window for making a printout of the current help topic.

"Help index"
"Help index" calls an alphabetical list of all help topics available for the active program.

Remark: If you would like a complete display of all entries in the list, maximize the size of the window.

When you select an index entry, the related topic is displayed.

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4.10.2 Versions

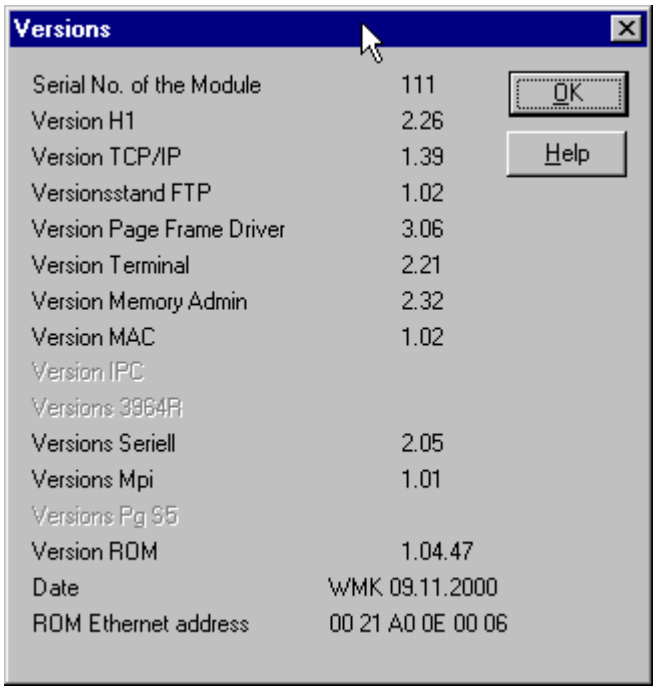

Figure 4-29 Versions

The versions of all programs are output in this window. In the example above, the complete **ROM Ethernet address** is: **00 21 A0 06 00 6F**. This address is made up of the first three bytes permanently assigned as the INAT identifier

INAT identifier: 00 21 A0

and the last three bytes of the **ROM Ethernet address** which you will also find on the label of the INAT Node Chip on the module.

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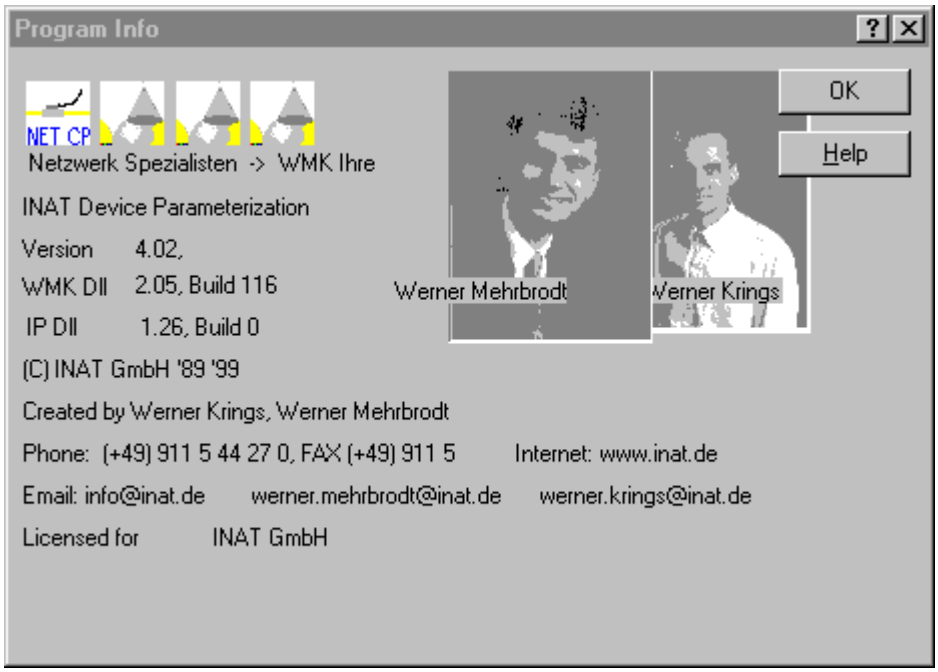
4.10.3 Program Information



4.11 Runtime Errors

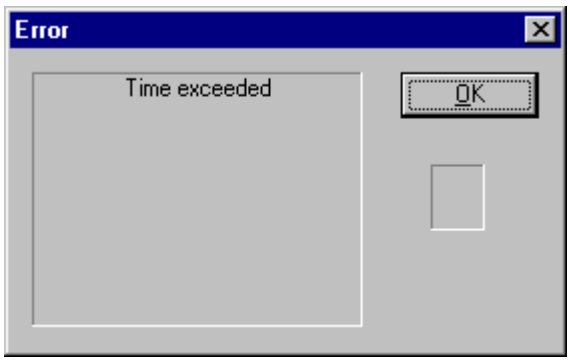


Figure 4-30 Example of an error message

Errors are always indicated in plain text. The following error messages can be output by the software.

- "No help text file“
- "Time exceeded"
- "Break received“
- "Baud rate error“
- "Parity error“
- "Overflow on the interface“
- "Wrong response from destination system“
- "Wrong OpCode from destination system“
- "Wrong length from destination system“
- "Data from destination system invalid“
- "Checksum wrong“
- "Timeout"
- "Driver error - probably no driver was installed“
- "Parameterization error“

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5 The Communication Blocks

The data exchange between the S7 TCP/IP and the CPU is organised with communication blocks in the CPU. For the data exchange there is a "Dual Port RAM" with a corresponding interface memory available. It can be read and written from both, the S7 TCP/IP and the CPU.

The INAT CP widens the possibillities of programming of the PLC by communication blocks. With these communication blocks you may access the network.

The following communication blocks are available for the INAT S7 TCP/IP:

Block Number	Description	Meaning
FC 242	NET_WORK	Internal block which has to be in the control for communication. It is called from other FCs.
FC 244	NET_SEND	It is used to transfer data from the own CPU to communication partners. NET_SEND distinguishes two types of jobs: SEND DIRECT and WRITE. WRITE transferres the destination of data via network
FC 245	NET_RECV	It is responsible for data transfer to the own CPU. NET_RECV distinguishes two types og jobs: RECEIVE DIRECT and FETCH. FETCH jobs request a certain data area from the other CPU.
FC 246	NET_ALL	The NET_ALL transferres data of passive jobs. At active transferres, it takes care of the succeeding blocks, if they are transferred blocked.
FC 248	NET_RST	It initiates the reset of a connection corresponding to a job number or the reset of all connections
FC 249	NET_SYNC	Synchronizes the CPU of the PLC and the communications processor.

The communication blocks work with special parameters like hardware address, job number and so on. An overview of the relevant parameters for the communication blocks is given in the Table of the parameters.

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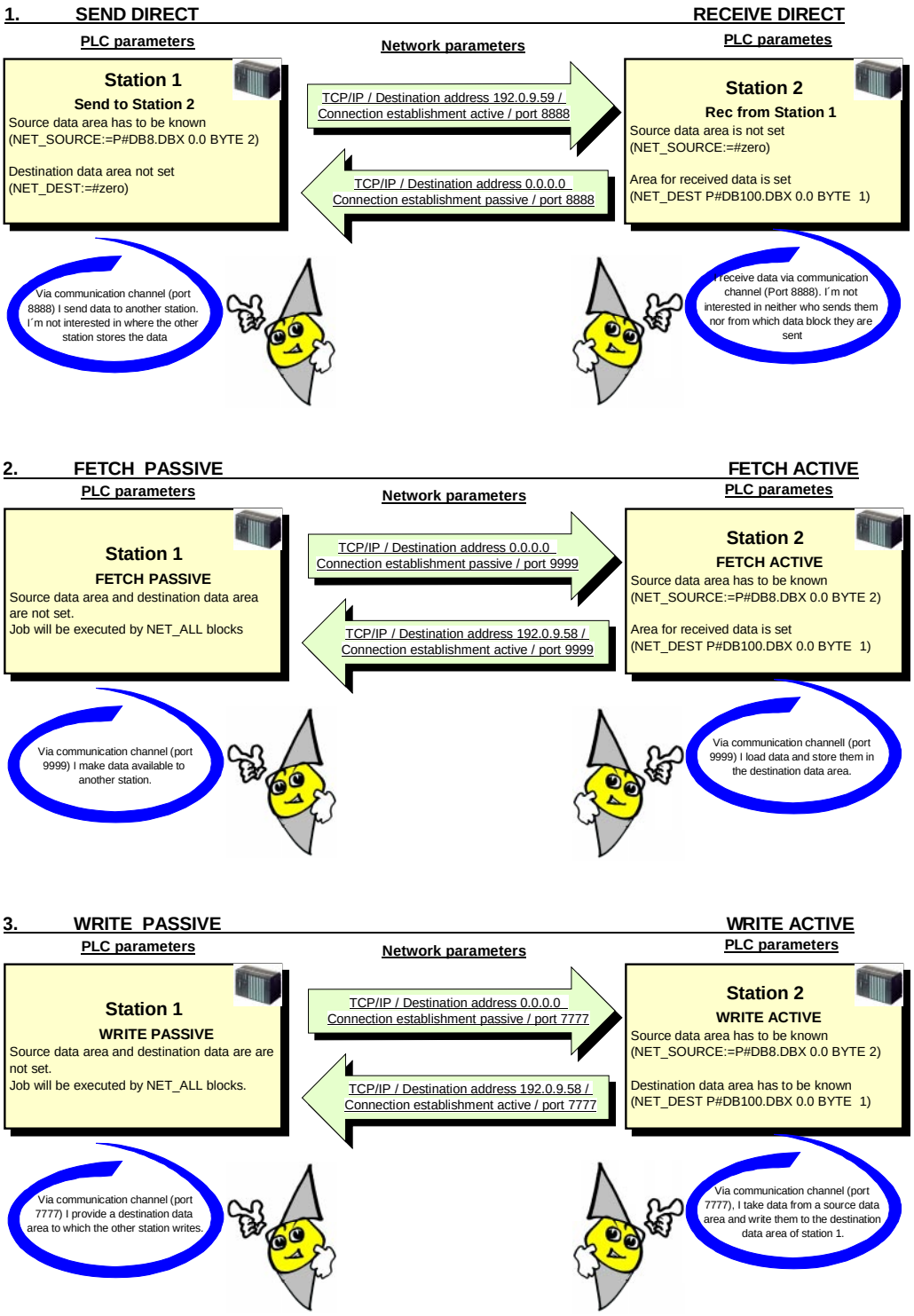
5.1 Exkurs Job types

The INAT S7-TCP/IP supports several job types. They are listed in the following overview. Station 1 has the IP address 192.0.9.58 and station 2 has the IP address 192.0.9.59.



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5.2 Parameter Table

The communication blocks work with the parameters listed in the following table.

Parameter	Use at						Meaning
	NET_SYNC	NET_ALL	NET_SEND	NET_RECV	NET_RST		
SIZE	X						Size of the Dual Port RAM
ACT_JOBS	X						Number of the direct jobs (with high performed status evaluation)
LADDR	X	X	X	X	X		Peripheral address of the CP from the hardware configuration of the SIMATIC Manager
ACT			X	X			TRUE / FALSE identifier
ID			X	X	X		Job number
NET_SOURCE			X	X			Source data area
NET_DEST			X	X			Destination data area
STATUS		X	X	X	X		Indication word for the status of the PLC and the CP. The CP indicates the status of the network connection and the transfer.
ERROR	X	X	X	X	X		Error return

5.2.1 „DPRAM Size“

Format: INTEGER

This parameter indicates the size of the DPRAM that may be maximally used for a run thru of the communication blocks (between an AS and a CP). This parameter is used just from the NET_SYNC block.

Note It is recommended to use "0" for parameter size. Then the maximal possible value (from harware) may be set.

5.2.2 ACT_JOBS "Number of Direct Jobs "

Format: INTEGER

With ACT_JOBS you indicate the number of desired direct jobs (with high performed status). This parameter is used just from the NET_SYNC block.

The number of the active jobs diminishes the size of the DPRAM. Select the active jobs with lower numbers 1,2,3... and set the Synchron to this number. This value remains 0 if no active jobs are used.

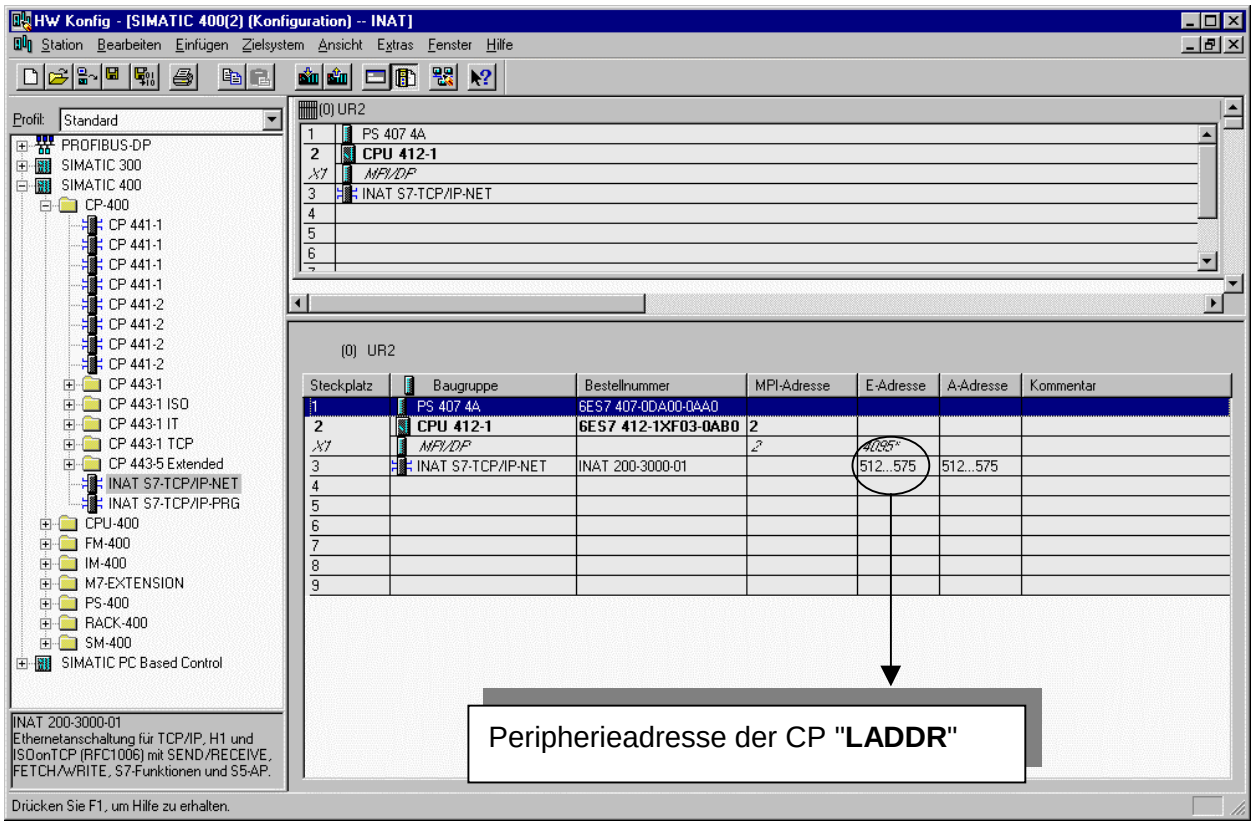
Just One byte of the DPRAM is used for 4 jobs. You may use even more direct jobs then given here. If you have a greater number of direct jobs the status will be worked up a litle slower.

Note It is necessary to decide dependent from the number of direct jobs with high performance and the needed size of used data, if you choose the number of ACT_JOBS.

5.2.3 LADDR Periphery address

Format: INTEGER

The parameter "LADDR" is the periphery address of the INAT S7 TCP/IP within the SIMATIC manager. It is dependent from the used slots. Please take this value from the hardware configuration of the SIMATIC manager.



5.2.4 ACT

Format: BOOL

This parameter is used just from the NET_SEND and NET_RECV blocks. By this parameter the blocks may be set as a job or as a status question.

Value = 1
If this value is equal 1 NET_SEND and NET_RECV FC are designed to start a job.

Value=0
If this value is equal 0, then NET_SEND and NET_RECV FC are just refreshing the STATUS and ERROR parameters. In this case NET_SOURCE and NET_DEST are ignored.

5.2.5 ID „Job number“

Format: INTEGER

This job number (ID) informs the CP on which channel to communicate with the CPU.

5.2.6 NET_SOURCE

Format: POINTER

This parameter indicates the source data area for NET_SEND and NET_RECEIVE block. The expression

```
NET_SOURCE:=P#DB100.DBX 0.0 BYTE  1
```

explains the following: the source data area in the data block 100 arrives from data bit 0.0 to data bit 0.7. If you won’t specify a data area so write:

```
NET_SOURCE:=#zero.
```

5.2.7 NET_DEST

Format: POINTER

This parameter gives the destination area of the NET_SEND and NET_RECEIVE blocks. The expression

```
NET_DEST:=P#DB100.DBX 0.0 BYTE  1
```

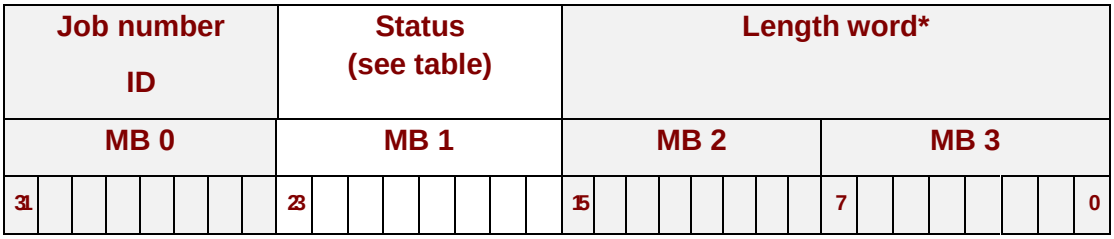
means: the destination data area in data block 100 arrives from the data bit 0.0 to data bit 0.7. If you won’t specify a data area so write:

```
NET_SOURCE:=#zero.
```

5.2.8 STATUS "Monitor Indication Double Word"

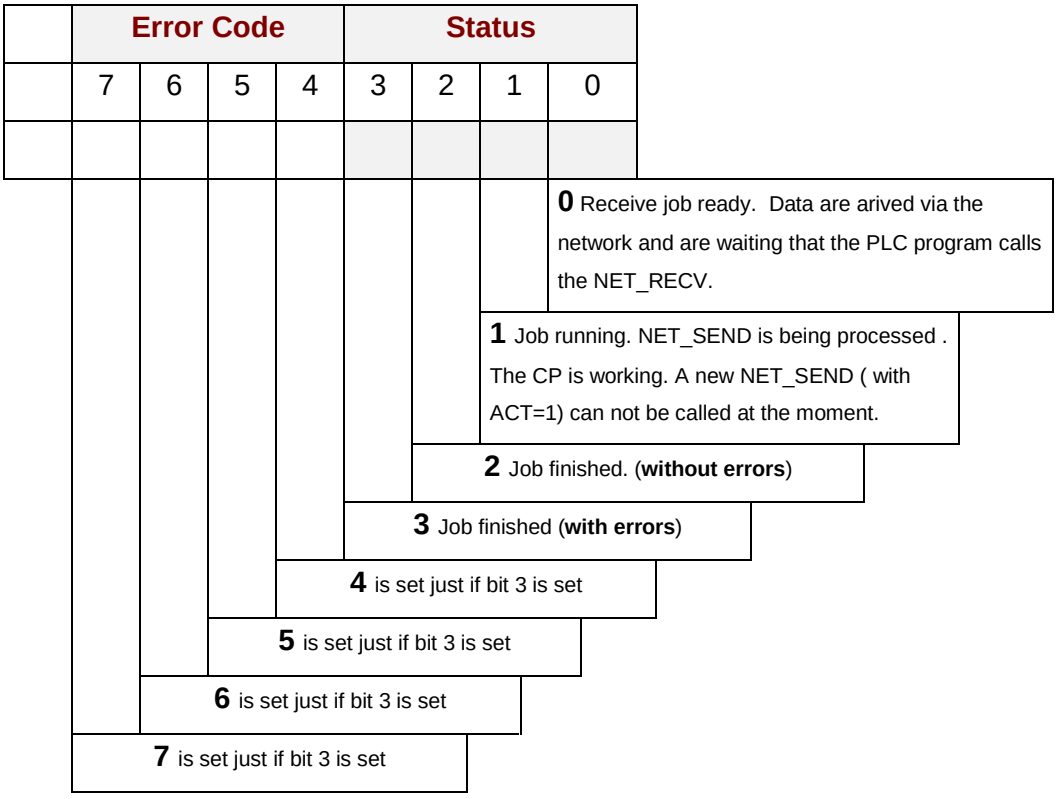
Format: DWORD

The monitor indication double word consists of 4 byte:



*MB2/MB3 = length word (number of bytes, transfered to/from the CP.)

The Status of the indication words allows a precise analysis of the communication. The possible return values are listed in the following table:



The error bits 4-7 are set if the bit "Job finished with errors"(bit 3) is set. The status can take the following values:

Dec	Hex	Explanation
0	0	No error
1	1	Wrong block type

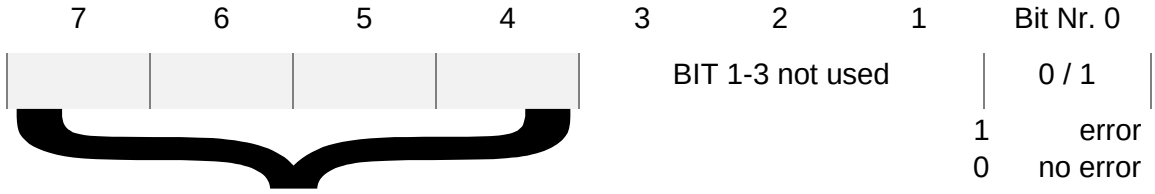
2	2	The area does not exist
3	3	Block too short
4	4	0 as length is not permitted
5	5	Wrong indication word
6	6	No source and no destination parameters. SEND needs a source and RECEIVE needs a destination.
10	A	The declared connection does not work.
14	E	Internal error
15	F	The declared connection is not parameterized.

Note: If the bits for "Job ready with error" and "Job running" are set simultaneously, there is no connection or there is no corresponding job parameterized on the CP. (FA or AA)

5.2.9 ERROR „Error return“

Format: BYTE

ERROR means the returned error value of the communication blocks. 0 means: no error. If the value is different from 0, then you may find out the reason of the error with the help of this number. You must do some changes (manually) in the CPU program or in the CP parameterization if an error was occured - but not if the CP isn't synchronized. The parameterization errors are registered in the high tetrade of this byte. For the meaning of the individual bits, see the following table:



Dec	Hex	Description	In STATUS	In ERROR
0	0	No error	X	X
1	1	Wrong block type	X	
2	2	Area does not exist	X	
3	3	Block too small	X	
4	4	Length 0 is not permitted	X	
5	5	Wrong indication word		X

6	6	No source and destination parameters. SEND needs a source, RECEIVE needs a destination.	**X**	
7	7	No CP on the given LADDR address.		**X**
8	8	Not synchronized		**X**
9	9	Not used		
10	A	The declared connection does not work	**X**	
11	B	Timeout in the CP		**X**
12	C	Not used		
13	D	Not used		
14	E	Internal error	**X**	**X**
15	F	The declared connection is not parameterized	**X**	

If an error occures the bit 0 is set. AA_h if there is no connection and FA_h if the connection is not parameterized.

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5.3 Description of the Blocks

5.3.1 FC 249 NET_SYNC

The FB 249 NET_SYNC synchronizes the CP with the CPU of the corresponding PLC. The communications blocks may be work off just after NET_SYNC block run. FB 249 is called in the start up blocks of : OB 100 and OB 101.

In STEP 7 the block has the following structure:

Parameter	Belegung	Example	Explanation
NAME:	FC 249		;NET_SYNC
LADDR:	INT	512	;The peripheral address of the CP
SIZE :	INT	0	;Size of the DPRAM; 0 is the maximum
ACT_JOBS	INT	4	;Number of the active jobs with high performance status analysis. The number of the given active jobs diminishes the total size of the DPRAM. Select the active jobs with low numbers 1,2,3..., and feed in the number at the Synchon. If you don't use active jobs this value remains 0. There is used 1 Byte of DPRAM for 4 jobs. You may use even more direct jobs then given here. If you use more direct jobs the status will be worked off slower.
ERROR :	BYTE	MB 14	;Error return

Note At SIZE feed in the desired size of the DPRAM.The size of the DPRAM shows how many bytes may be transferred by calling the blocks NET_SEND and NET_RECV. We suggest to use the value "0" for the parameter SIZE. This way the maximum value, pretended from the hardware, is set.

5.3.2 FC 246 NET_ALL

The NET_ALL block handles the communication of the passive jobs. It is envolved in the transmittion of the RESET data if the transmission occures about a NET_SEND or NET_RECV and there should be transmitted more data then the size of DPRAM.

The NET_ALL is necessary for correct communication handling.

The block has in the STEP 7 source code the following structure. The parameters passed in the NET_ALL block are listed in the table bellow.

Note To ensure a maximum data transfer, the NET_ALL block should be triggered as often as possible within the cycle. This should especially be done at long cycle times (> 300ms). The NET_ALL block should be triggered in an independent and scalable timer block.

Parameter	Allocation	Example	Explanation
NAME:	FC 246		;NET_ALL
LADDR:	INT	512	;Periphery address of the CP
STATUS:	DWORD	MD100	;Status indication of the PLC or of the CP. STATUS returns the ID that was actually edited. The status bits are set and the length of the transmitted data is returned to the PLC programm.
ERROR :	BYTE	MB110	;Parameterization error

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5.3.3 FC 244 NET_SEND

NET_SEND enables you to send data to another communication partner. There are two types of SEND and WRITE blocks.

Note **The selection between SEND and WRITE occures by the determination of the job type in the INAT Parameterization software!**

1. SEND DIRECT or WRITE with the Source = Destination

A send job is triggered. The data are sent via LAN to the communications partner without to mention the destination data area. Just the source data area is declared in the parameter NET_SOURCE.

2. WRITE with Source ≠ Destination

A certain send job is triggered. The data are sent to the communications partner via LAN. Here the data are stored in accordance with the destination parameters. The destination and the sourse data area are declared.

Parameter	Allocation	Example	Explanation
NAME:	FC 244		;SEND DIREKT/ WRITE
LADDR:	INT	512	;Periphery address of the CP
ACT	BOOL	See Note 1	
ID:	INT	2	;Job number
NET_SOURCE	POINTER	P#DB100.DBX 0.0 BYTE 1	;The source data area of the own CPU. From this CPU the data are sent.
NET_DEST (SEND DIRECT)	POINTER	#zero	;Destination data area filled with #zero , when SEND DIRECT or WRITE has the source equal to the destination.
NET_DEST (WRITE)	POINTER	P#DB110.DBX 0.0 BYTE 1	;Destination data area for WRITE in the far CPU; here the data that should be sent are stored.
STATUS:	DWORD	MD100	;Status indication
ERROR :	BYTE	MB110	;Parameterization error

Note 1 **A job with ACT=TRUE is a send job. With ACT=FALSE the parameter STATUS and ERROR will be updated.**

Note 2 **If you declare the job in the Parameterization as "SEND with no Protocol" the "NET_DEST" parameter are ignored.**

Note 3 **If you may transfer more data than the size of the DPRAM, the NET_ALL will transfer the rest of the data.**

5.3.4 FC 245 NET_RECV

The block NET_RECV gives the job for receiving data from another communications partner. There are two types of NET_RECV blocks:

Note **The selection between RECEIVE DIRECT and FETCH occures by the determination of the job type in the INAT Parameterization software!**

1. RECEIVE DIRECT or FETCH with Source = Destination

A receive job is triggered. The data are fetched from the LAN without to declare the destination data area. Just the destination data area in the own CPU is mentioned in the NET_DEST parameter.

2. FETCH with Destination ≠ Source

A receive job is triggered. The data are fetched active via LAN from the communications partner. The source data area is known. They are stored in accordance with the destination data area.

Parameter	Allocation	Example	Explanation
NAME:	FC 245		;RECEIVE DIREKT, FETCH
LADDR:	INT	512	;Periphery address of the CP
ACT	BOOL	See Note 1	
ID:	INT	3	;Job number
NET_SOURCE (*RECEIVE DIRECT*)	POINTER	#zero	;Source data area filled with 0 if RECEIVE DIRECT or FETCH has: Source = Destination.
NET_SOURCE (*FETCH*)	POINTER	P#DB100.DBX 0.0 BYTE 1	;Source data area of the own CPU. From this CPU the data are sent.
NET_DEST	POINTER	P#DB100.DBX 0.0 BYTE 1	;Destination data area. Shows the data area where the received data are stored.
STATUS:	DWORD	MD100	;Status indication
ERROR :	BYTE	MB110	;Parameterization error

Note 1 **A job with ACT=TRUE triggers a receive job. With ACT=FALSE the parameter STATUS and ERROR will be updated.**

Note 2 **If you declare the job in the Parameterization as "RECEIVE with no Protocol" the "NET_SOURCE" parameter are ignored.**

Note 3 **If you may transfer more data than the size of the DPRAM, the NET_ALL will transfer the rest of the data.**

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5.3.5 Indication for the use of the #Zero Pointer

The structure of the address parameter #zero (used in NET_SEND and NET_RECV) is the following:

```
Local variables declaration temp
Name zero Typ ANY
      L     P##zero                  // load local variables
      LAR1                           // to address register 1

      L     B#16#10
      T     LB [AR1,P#0.0]           // Indication for Any-Pointer
      L     B#16#0
      T     LB [AR1,P#1.0]           // Indication for Nil
      L     0
      T     LW [AR1,P#2.0]           // Transmission length plus
                                        1 Word
      L     W#16#2
      T     LW [AR1,P#4.0]           // data block number
      L     P#DBX 0.0
      T     LD [AR1,P#6.0]           // start address of the marker
```

How to use the #zero parameter in the NET_SEND block within the PLC programm:

```
CALL  FC   244             // retrieve status as long as DB runs
 ACT       :=FALSE         // with FALSE this is a control block
 LADDR     :=512           // CP address of the HW configuration
 ID        :=2             // job number like at NET_SEND
 NET_SOURCE:=#zero         // Any-Pointer
 NET_DEST  :=#zero         // Any-Pointer
 STATUS    :=MD204         // Indicator Double-word
 ERROR     :=MB212         // Error restitution
```


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5.3.6 FC 248 NET_RST

The RESET block FB 248 stops one or all jobs that are running through a given interface. NET_RST stops running jobs. After a short time the connections will be passed for the communication.

You may differ between two RESET functions:

1. NET_RST with the ID = 0: In this case all running jobs will be stopped.

2. NET_RST with the ID different from 0: If you choose a job number, so just this job will be stopped.

The block in the STEP 7 source code has the following structure. The table lists the relevant parameters for the NET_RST.

Parameter	Allocation	Example	Eplanation
NAME:	FC 248		;NET_RST
LADDR:	INT	512	;the periphery address of the CP
ID :	INT	2	;job number
STATUS:	DWORD	MD100	;status indication of the CP
ERROR :	BYTE	MB110	;parameterization error

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6 Appendix

6.1 The INAT SPS Header

The data stream-oriented TCP/IP protocol can combine several short data units into longer units. This feature increases data throughput on the network. As with other protocols (i.e., FTP and HTTP), this requires a data header ahead of the TCP in the protocol. The header format shown in the table was declared for data transmission to the CPU of the SIMATIC S7 controller via the INAT CP. The bytes of an 8-byte header contain the following informations:

Table 6-1: Format of the SPS header

No of the Byte	Meaning
Byte 0	0x4d ´M´
Byte 1	0x4b ´K´
Byte 2[3]	Datalen LSB[1] Length of the data in the packet after the header
Byte 3[3]	Datalen MSB[2]
Byte 4[3]	Bit 0 = 1, if further frames follow
Byte 5[3]	0
Byte 6[3]	SeqNo. LSB[1]
Byte 7[3]	SeqNo. MSB[2]
Datalen bytes	User data

[1]LSB: Least (Lower) Significant Byte

[2]MSB: Most Significant Byte (Höherwertiges Byte)

[3] Together bytes 2 / 3, byte 4 / 5 and byte 6 / 7 have the data value "short". They are represented in INTEL format

Acknowledges

If DataLen is 0, a life data acknowledge (Life Data Ack) is involved and not user data. Data acknowledges permit a form of connection monitoring which the TCP/IP actually does not provide for as remote-communication frame. Since the standard times for connection monitoring correspond to those of the H1 protocol, the INAT CP-System is compatible with H1 as seen from the PLC or PC.

Sequence number

Byte 6 and byte 7 represent a sequence number which has the value 0 when the connection is established and which is incremented by one each time user data are sent. This frame counter is used as an additional safety mechanism for the data transmission. When life data acks are sent, the sequence number is not incremented and DataLen is 0.

Fetch and write connections

For fetch and write jobs, the first 16 data bytes correspond to the SINEC AP header when a job is started. The SINEC AP header is also used for communication via H1.

Sending / receiving data

When data are sent via the INAT CP, a maximum of 512 bytes of user data are sent in one frame. This maximum value is determined by the size of the page frame block which is set. When data are received, one data packet can contain up to 1460 bytes. Since these limits are automatically monitored by the TCP/IP protocol, no further monitoring is required on the user side.

Transmission without frame header

The header at the beginning of the frame can be disabled. If this is done, the application program on both sides is responsible for monitoring. Keep the following points in mind:

1. Particularly in the case of the *Send Direct* and *Receive Direct* jobs, certain time limits until frame acceptance may not be exceeded. If these time limits were violated, the internal buffers would be overloaded (e.g., with inquiries), and synchronization of request and response would no longer be possible.

2. A certain mechanism for blocked data transmission must be adhered to so that the end of the user data can be detected.

3. The receiving side must ensure that the frames are read from the receiving buffer before the partner station sends the next frame.

Creation of connection monitoring in the application program is indispensable.

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6.2 Comparision of the type of jobs (S5)

If you want to establish a connection between INAT S5-TCP/IP and the Siemens network interfaces CP 1430 and CP 143, you should remember the different nomenclature of the jobs.

In the table you will find the configuration inputs for the Siemens modules if the INAT job types are set.

Table 6-2: Comparision of the type of jobs INAT S5-TCP/IP / CP 1430 /143

INAT Job	Send Direct	Receive Direct	Fetch Passive	Write Passive	Fetch Active	Write Active
Type of job	Send	Receive	Fetch	Receive	Fetch	Send
READ/WRITE	N	N	J	J	J	J
Active/Passive	(A)	(P)	P	P	A	A
HTB[1]-type	Send	Receive	Receive All	Send All	Fetch	Send

[1] Type of the standard handling blocks

6.3 List of Abbreviations

A

ABM	Asynchronous Balanced Mode
AFI	Authority and Format Identifier (specified by the network administrator)
AK	Data Acknowledgment
AP	Application Protocol
AS	Automation System of the S7 SIMATIC
ASIC	Application Specific Integrated Circuit

B

BIOS	Basic Input Output System (lower system services for computer operation)

C

Cache	Intermediate storage. Uses to increase speed.
CSMA/CD	Carrier Sense Multiple Access with Collision Detect Connection Confirm CCITT Consultative Committee for International Telegraphy and Telephony
CR	Connection Request
CRC	Cyclic Redundancy Check
CSMA/CD	Carrier Sense Multiple Access with Collision Detect

D

DA	Destination Address
DC	Disconnect Confirm
DISC	Disconnect
DLC	Data Link Control
DM	Disconnect Mode DPM1 DP master (class 1)
DR	Disconnect Request
DSP	Domain Specific Part (the addressed station)
DT	Data Dual-Port

E

EA	Expedited Data Acknowledgment
ED	pedited Data
ER	Error Report

ESD	Electro Sensitive Device

F

FCS	Frame Check Sequence
FDL	Fieldbus Data Link
FMA	Fieldbus Management
FMS	Fieldbus Message Specification
FRMR	Frame Reject Response

H

HDLC	High-Level Data Link Control

I

I	Information
ID	Identifier
IDI	Initial Domain Identifier (the addressed network)
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronic Engineers
Intel format	Number-byte representation format
Interrupt	Interrupt for the processor
ISO	International Organization of Standardization

K

KBL	Communication relationship list. List of all communication relationships of one station.
KR	Communication Reference. Local short designation for a communication relationship.

L

LAN	Local Area Network
LI	Length Indicator
LLC	Logical Link
LSB	Least Significant Bit

M

MAC	Media Access
MS	More Segments

MSB	Most Significant Bit

N

NRZ	Non Return to Zero

O

OV	Object directory

P

Plug and Play	(PNP) Detection system for hardware
PNO	PROFIBUS user organization
Polling	Continuous polling. Not very efficient especially for multitasking systems such as OS/2 or Windows NT.
PDU	Protocol Data Unit
PLC	Programmable Logic Controller

R

R(E)J	Reject
RNR	Receiver Not Ready
RR	Receiver Ready

S

SA	Source Address
SABME	Set Asynchronous Balanced Mode Extended
SAP	Service Access Point
SFD	Start Frame Delimiter
SLOT	Slot on the computer
SP	Segmentation Permitted

T

TOP	Technical and Office Protocols
TPDU	Transport Data Control Unit
TSAP	Transport Service Access Point

U

UA	Unnumbered Acknowledge
UI	Unnumbered Information

V

VFD	Virtual Field Device. The VFD is the part of a real device which can be addressed for communication.

W

WAN	Wide Area Network

X

XID	Exchange Identification
XNS	Xerox Network System

6.4 TCP/IP RFCs (Request for Comments)

[RFC768] Postel, J., "User Datagram Protocol", STD 6, RFC 768, USC/Information Sciences Institute, August 1980.

[RFC791] Postel, J., "Internet Protocol - DARPA Internet Program Protocol Specification", STD 5, RFC 791, DARPA, September 1981.

[RFC792] Postel, J., "Internet Control Message Protocol - DARPA Internet Program Protocol Specification", STD 5, RFC 792, USC/Information Sciences Institute, September 1981.

[RFC793] Postel, J., "Transmission Control Protocol - DARPA Internet Program Protocol Specification", STD 7, RFC 793, USC/Information Sciences Institute, September 1981.

Protocols of the Network Layer

RFC 791 : **IP** (Internet Protocol)

The Internet protocol provides a way of sending datagrams from source to destination regardless of whether these devices are located in the same network or in different networks. In addition to this IP addressing, the protocol handles fragmentation (if requested) of data packets transferred by the transport instance. IP is not a secure service.

RFC 792 : **ICMP** (Internet Control Message Protocol)

ICMP is an Internet control protocol which informs the network of unexpected events detected by the routers. Each ICMP message type is enclosed in an IP packet.

RFC 826 : **ARP** (Address Resolution Protocol)

Since the hardware of the security layer (i.e., Ethernet card) does not understand 32-bit IP addresses, ARP locates the corresponding 48-bit Ethernet addresses by sending a broadcast packet to the Ethernet searching for the owner of a certain IP address. Every device in the network receives the packet and checks its IP address. The desired host then reports to the requesting host via its Ethernet address so that the transport layer can establish a connection.

RFC 903 : **RARP** (Reverse Address Resolution Protocol)

RARP permits a work station which has just booted to send out its Ethernet address and to request its own IP address. The RARP server "sees" this request, searches its configuration files for the Ethernet address, and sends back the appropriate IP address.

A server is required since routers do not forward broadcast messages.

RFC 951 : **BOOTP** (Bootstrap Protocol)

BOOTP is a protocol which helps diskless computers to boot. It uses UDP messages which are distributed by routers .

Protocols of the Transport Layer

RFC 793 : **TCP** (Transmission Control Protocol)

TCP is a secure, connection-oriented protocol which sends an error-free byte stream from one device to another over Internet. It splits up the incoming byte stream into single messages and forwards these to the network layer. At their destination, the single messages received by the TCP process are recombined into an output stream. TCP also handles flow monitoring (i.e., to prevent slow receivers from being overwhelmed with messages from high-speed senders). Connection establishment is based on the three-way handshake principle. Communication between senders and receivers is handled by TSAPs, often referred to as *sockets* in TCP/IP jargon.

RFC 1122 : Error corrections for TCP in accordance with RFC 793

RFC 1323 : Expansions for TCP in accordance with RFC 1122

RFC 768 : **UDP** (User Datagram Protocol)

UDP can be used by applications to transfer enclosed raw IP datagrams without having to establish a connection. This protocol is primarily used for one-time requests and applications in client/server environments in which speed is more important than precision (e.g., transmitting voice or video).

Protocols of the Processing Layer

RFC 1034

RFC 1035: **DNS** (Domain Name Service)

The DNS protocol was developed for conversion of ASCII-character-set host names and E-mail addresses into binary IP network addresses. For example, the E-mail address "mary@eagle.cs.uni.edu" can be identified with the IP address "192.31.65.5." The DNS protocol uses a distributed data base system based on a hierarchical convention of.

RFC 1441

bis 1452: **SNMP** (Simple Network Management Protocol)

SNMP is a systematic method of monitoring and administering a computer network.

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